DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service

Blackfeet Hospital
Indian Health Service
Environmental Engineering
PO Box 760
Browning, MT 59417

Set. No. _____

BLACKFEET COMMUNITY WATER PROJECT

PLANS AND SPECIFICATIONS

FOR

CONSTRUCTION

OF

WATER LINE AND STORAGE TANK
LOWER TWO MEDICINE LAKE TO EAST GLACIER MT.

A PHASE I ACTIVITY

FOR

THE BLACKFEET TRIBE

BROWNING, MONTANA

BCWP P1-002

JUNE 2002

CONSTRUCTION SPECIFICATIONS

DIVISION 1 – GENERAL REQUIREMENTS

DIVISION 2 – SITE CONSTRUCTION

DIVISION 3 - CONCRETE

DIVISION 13 – SPECIAL CONSTRUCTION

SECTION 01000
SPECIAL PROCEDURES

PART 1 – GENERAL

1.01 DESCRIPTION

A. Work to be performed under this contract includes the construction of a new Intake Water Transmission Main from the intake structure at Lower Two Medicine Reservoir to the proposed water treatment plant and the East Glacier Water Main from the proposed water treatment plant to East Glacier and a 200,000 gallon water storage tank. The intake structure and the water treatment plant are to be constructed under separate contracts.

B. The project site is located near the border of Glacier National Park. The Contractor shall conform with all the requirements of the Project's Environmental Assessment as well as the Biological Assessment. These documents can be viewed on the Blackfeet Community Water Project's website:

http://www.ihs.gov/FacilitiesServices/AreaOffices/billings/oehe/index.asp.

The Contractor's ways and means of accomplishing the work shall be compatible with all environmental considerations and restrictions in the area.

1.02 TIME OF COMPLETION

A. The Contractor shall commence work on the date specified on the Notice to Proceed with Construction and shall complete all work by September 30, 2003. No work on project will be allowed during the period of March 1, 2003 through July 14, 2003. A Notice to Proceed with Construction will not be issued before July 15, 2002 in compliance with the Project's Environmental Assessment. Seeding, disinfection, hydrostatic testing, and other minor clean-up may occur after March 1, 2003. Additional construction contracts for the intake and water treatment plant will be in place from July 2002 through March 2004. The Contractor shall coordinate his work carefully and cooperate with other contractors through the Owner to avoid interference.

1.03 BIDDER'S QUALIFICATIONS

A. The successful bidder shall show evidence that he has the finance, organization, and equipment to perform the work with a limited number of subcontractors and in the time frame required. The bidder cannot be overdue on completion of any other public works project.

B. The Contractor shall have experience installing polyethylene pipe of similar size.

C. The Contractor shall employ a person experienced in fusion technology and who holds a current certification in fusing HDPE pipe from a pipe manufacturer.

1.04 CONSTRUCTION SCHEDULE

A. The Contractor shall provide within two weeks of the Notice of Award, the Owner with a construction schedule showing the projected progress of the contract. The Owner must

concur with the Construction Schedule before a Notice to Proceed is issued. The Contractor shall provide an updated Construction Schedule monthly with each pay request.

1.05 ORDER OF PRECIDENCE

A. The General Conditions as modified by Special Procedures, Division 1 General Requirements shall govern over the construction specifications should a discrepancy exist. Anything not covered in the construction specifications shall be covered by the Montana Public Works Standard Specifications.

1.06 USE OF EASEMENTS AND ADJOINING PROPERTY

A. The Contractor shall stay within the right-of-way shown on the plans and access to the right-of-way is identified on the plans. The Contractor will work closely with the Owner's Representative to attain adequate access to the site, within the identified existing access areas.

B. The Contractor shall utilize only those access roads identified on the plans or cleared with the Owner's Representative.

1.07 SAFETY

A. In accordance with generally accepted construction practices and the requirements of the Occupational Safety and Health Administration Standards, the Contractor shall be solely and completely responsible for conditions of the job site, including safety of all persons and property affected directly or indirectly by his operations during the performance of the work. This requirement will apply continuously, 24 hours per day until acceptance of the work by the Owner and shall not be limited to normal working hours.

B. The duty of the Project Engineer or the Owner to conduct construction review of the Contractor's performance is not intended to include review of the adequacy of the Contractor's safety measures in, on or near the construction site.

C. The Contractor shall provide adequate signs, barricades, and lights and take all necessary precautions for the protection of the work and the safety of the public and wildlife.

1.08 SURFACE WATER, GROUNDWATER AND SOILS

A. The plans indicate intermittent creeks which cross the pipeline right-of-way. Additional surface water runoffs may exist at the time of construction. The Contractor is encouraged to familiarize himself with the construction area and areas of possible surface water.

B. The Contractor will be responsible for obtaining an NPDES General Permit for Storm Water Discharges from Construction Activities from the EPA through the Blackfeet Environmental Office, Blackfeet Tribe. Please contact Ms. Kari Sawyer at (406)338-7421.

C. A soils investigation was performed and the results are located in the Appendix of these specifications. The investigation was performed in October 2001 and the groundwater levels may not be reflective of the report. The Contractor is encouraged to perform his own investigation. Rock was not encountered during the soils investigation.

PART 2 – PRODUCTS, NOT USED

PART 3 – EXECUTION, NOT USED

PART 4 – MEASUREMENT AND PAYMENT, NOT USED

END SECTION 01000

SECTION 01110
SUMMARY OF WORK

PART 1 – GENERAL

1.01 DESCRIPTION

A. The Invitation to Bid contains a general description of the project work to be performed under this Contract. The Special Provisions and other documents contain additional information necessary to perform the work.

B. This Contract provides for the construction of the following:

1. Materials and installation of 13,400 lineal feet of 20-Inch, DR 15.5 HDPE intake transmission water main and 7,400 lineal feet of 12-Inch, DR 11 HDPE water main with accompanying appurtenances.
2. Materials and installation of nine (9) Combination Air Release/Vacuum Release Valves and Boxes.
3. Materials and installation of eleven (11) Flushing Hydrants.
4. Materials and installation of a 200,000-Gallon Steel-Bolted, Glass Lined water storage tank with accompanying appurtenances.
5. Materials and installation of five (5) 12-Inch Gate Valves and Boxes.
6. Materials and installation of nine (9) 20-Inch Butterfly Valves and Boxes.

1.02 CONTRACT DOCUMENTS

A. Portions of the Contract Documents are written in the imperative mode. Except where specifically intended otherwise, the subject of all imperative statements is the Contractor. For example, “Furnish...” means “Contractor shall furnish...”,”Provide...” means “Contractor shall provide...”. For imperatives specifically addressing the Project Engineer/Owner, see paragraph 3.4 of the General Conditions.

B. Contract Documents are defined in Article 1, paragraph 1.10 of the General Conditions, as modified by Montana Public Works Standard Specifications, any supplemental conditions and Article 8 of the Agreement Form.

C. The Contract Documents are intended to provide the basis for proper completion of the work suitable for the intended use of the Owner. Comply with Article 3, General Conditions. Specifications and drawings included in these Contract Documents establish the performance, quality requirements, location and general arrangement of materials and equipment, and establish the minimum standards for quality of workmanship and appearance. Anything not expressly set forth but which is reasonable implied or necessary for proper performance of the project shall be included.

D. The various portions of the Contract Documents, of which these specifications are a part, are essential parts of the Agreement, and a requirement occurring in any portion or part is binding as though occurring in all. All portions are intended to be complementary and to describe and provide for a complete work. Unless specifically noted otherwise, in the case of discrepancy the following hierarchy shall be observed:

1. Addenda, which will govern over;

2. Special Provisions, which will govern over;
3. Standard Modifications, which will govern over;
4. Supplementary Specifications, which will govern over;
5. Project Drawings, which will govern over;
6. These Specifications and Standard Drawings

E. A requirement mentioned in one part/section of the Contract Documents shall be considered as having been mentioned in all parts/sections.

1.03 CONTRACTOR USE OF PREMISES:

A. Comply with paragraphs 6.16, 6.17 and 6.18 of the General Conditions and as specified in the Contract Documents.

B. Do not park vehicles or equipment or store materials on private property without written permission from the property owner. Provide Project Engineer/Owner with a copy of authorization.

1.04 BLACKFEET TRIBAL EMPLOYMENT RIGHTS OFFICE (TERO)

A. The Contractor shall meet all requirements of the Blackfeet Tribal Employment Rights Office. Contact Rodney Gervais or Gene Grant at 406-338-7887.

1.05 OWNER-FURNISHED ITEMS

A. Owner-furnished items are listed in the Contract Documents.

PART 2 – PRODUCT, NOT USED

PART 3 – EXECUTION, NOT USED

PART 4 – MEASUREMENT AND PAYMENT, NOT USED

END SECTION 01110

SECTION 01140
WORK RESTRICTIONS

PART 1 – GENERAL

1.01 DESCRIPTION

A. This section specifies the work restrictions that affect construction operations.

B. Contractor must adhere to all restrictions specified in this section.

1.02 WORK AREA BOUNDARIES

A. All construction activities shall be conducted within the 50-foot Right-of-Way, indicated on the drawings and within 20 feet each side of the access roads to the project site. The access roads are identified on the plans.

B. The workers and equipment shall stay within these boundaries at all times.

C. The Contractor shall clearly mark or flag these boundaries so that workers and equipment operators clearly understand where the boundary is.

D. All vehicles and equipment must stay on approved access roads. These access roads shall be clearly marked by the Owner prior to construction.

1.03 RESTORATION OF DISTURBED AREAS

A. Removal of trees and shrubs shall only be allowed in the 50-foot Right-of-Way. All areas that are disturbed shall be top soiled and seeded with **native grasses as specified in these documents.**

B. Trees that are removed from the 50-foot Right-of-Way shall be piled in a manner such that wildlife dens are created.

1.04 FIREARMS

A. No firearms of any type or size will be allowed on the project site or in the vicinity of the project site.

1.05 WILDLIFE

A. Many types of animals and birds frequent the project site including grizzly bear, black bear, mountain lions, moose, deer and bald eagles. The Contractor shall use extreme care to protect and prevent disturbance of existing wildlife.

B. The Contractor shall erect barricades as necessary to prevent wildlife from falling into any excavations.

1.06 REMOVAL OF BEAR ATTRACTANTS

A. The Contractor shall remove all bear attractants from the project site at the end of each day.

B. Bear attractants include human waste, food and garbage of all types.

1.07 CAMPING

A. Workers will not be allowed to camp at the project site.

B. Workers may camp at the existing developed campground about ½-mile from the dam at the Lower Two Medicine Reservoir. The Contractor will have to provide sanitary facilities, water and garbage disposal. The Contractor is responsible for removing sanitary waste and garbage from the campground daily.

1.08 BRIDGE WEIGHT LIMIT

A. The existing road that provides the western access to the site, refer to map in plan section, crosses the Two Medicine River on a bridge that has a 40-ton unposted weight limit. The contractor must contact the Bureau of Indian Affairs Roads Department to request an overload permit and information on requirements to obtain a permit if the Contractor wishes to exceed the 40-ton limit. Contact John Monroe at Blackfeet Planning (406-338-7406) for information on BIA Roads. Any modification of the existing bridge must be accepted and approved by the Bureau of Indian Affairs.

1.09 ACCESS

A. Primitive roads provide the only access to the project site.

B. Contractor shall use only those roads flagged or marked by the Owner.

C. Contractor must get approval from Owner prior to widening or improving any of these access roads.

1.10 DISPOSAL OF WASTE MATERIAL

A. The Contractor shall be responsible for the disposal of all human waste, garbage, concrete, pipe, rock and other materials during construction.

B. Human waste, garbage or any other material that may attract bears shall be removed from the project site at the end of each working day.

C. Contractor shall coordinate all waste disposal with the Blackfeet Utilities Commission. Contact Robert DesRosier, Director, at 406-338-7667 or FAX 406-338-3331.

D. The Contractor shall merge and include all costs and fees related to the transport and disposal in his contract bid price for related work. No additional payment shall be made for waste disposal.

1.11 UNDERGROUND UTILITIES

A. The Owner assumes no responsibility for determining the location of any existing underground utilities in the project area.

B. The Contractor is solely responsible for contacting all potential utility owners in the area and determining their location prior to beginning construction.

C. Failure of the owner to show the existence of subsurface objects or installations on the plans shall not relieve the Contractor from his responsibility to make independent checks on the ground, nor relieve him from all liability for damages resulting from his operations.

1.12 TEMPORARY ELECTRICAL POWER AND TELEPHONE

1. There is no existing utility power service and no existing telephone service in the vicinity of the project site.

2. The Contractor shall provide electrical power generation as necessary for temporary power needs during construction.

3. The Contractor shall also provide his own telephone or other communication equipment or service.

1.13 ACCESS

A. Access to the pipeline right-of-way shall be limited to the access points shown on the plans.

B. No other access points are available.

1.14 ARTIFACTS

A. The Archaeological Assessment did not indicate any artifacts along the water main right-of-way. Any artifacts found or observed will be left in place and reported to the Project Manager. If artifacts are found or suspected, all work shall stop.

PART 2 – PRODUCT, NOT USED

PART 3 – EXECUTION, NOT USED

PART 4 – MEASUREMENT AND PAYMENT, NOT USED

END SECTION 01140

SECTION 01290
MEASUREMENT AND PAYMENT

PART 1 – GENERAL

1.01 DESCRIPTION

A. This section describes the methods for measurement and payment for items of work covered in the Contract Documents.

B. The total Bid Price for each section of the Contract shall cover all Work required by the Contract Documents. The quantity of each item listed on the Bid Schedule shall be measured, counted or otherwise determined according to the units specified by this section for that item. Payments shall be based on work performed in accordance with the drawings and specifications of this Contract at the respective Contract Unit Bid Price for each item listed on the Bid Schedule. Such payment shall constitute full compensation. No separate payment shall be made for incidental work including, but not limited to, excavation, backfilling, thrust blocks, concrete work or other items not specifically listed on the Bid Schedule. Incidental items not listed on the Bid Schedule shall not be paid for separately but shall be considered as a subsidiary to and a part of the cost of the applicable Contract Bid Item.

1.02 ESTIMATED QUANTITIES

A. All estimated quantities provided on the Bid Schedule or other Contract Documents are approximate and are to be used for the purpose of comparing Bids. The actual amount of work done and materials furnished under Unit Price items may differ from the estimated quantities.

B. The basis of payment for work and materials will be the actual amount of work done and materials furnished.

PART 2 – PRODUCT, NOT USED

PART 3 – EXECUTION, NOT USED

PART 4 – MEASUREMENT AND PAYMENT

4.01 PAYMENT ITEMS

A. MOBILIZATION

1. No separate measurement will be made for items included in this work.

2. Payment shall be made at the contract lump sum price for mobilization. The lump sum price will not exceed five percent (5%) of the total base bid.

3. This payment shall include all cost associated with mobilization including but not limited to, bonds, insurance, mobilization and demobilization, on-site equipment storage, administration facilities, sanitary facilities, temporary electric power, telephone service.

B. HDPE WATER MAIN (SECTION 2510)

1. The number of lineal feet of HDPE water main shall be measured along the centerline of the pipe including the length of fittings and valves.

2. Payment for the measured number of lineal feet of water main shall be made at the applicable Contract Unit Bid Price for the appropriate size pipe.

3. This payment shall include all costs associated with the water main and fitting installation, in place, ready for use.

C. FLUSHING HYDRANTS (SECTION 02718)

1. The number of Flushing Hydrants installed shall be counted.

2. Payment shall be made at the applicable Contract Unit Bid Price.

3. This payment shall include all costs associated with the installation of the Flushing Hydrants including tee and gate valve, in place, ready for use.

D. COMBINATION AIR RELEASE / AIR VACUUM VALVES (SECTION 02718)

1. The number of Combination Air Release/Air Vacuum Valves installed shall be counted.

2. Payment shall be made at the applicable Contract Unit Bid Price for the appropriate size Combination Air Release/Air Vacuum Valve.

3. This payment shall include all costs associated with the installation of the Combination Air Release/Air Vacuum Valves, in place, ready for use.

E. GATE VALVES (SECTION 02718)

1. The number of Gate Valves installed shall be counted.

2. Payment shall be made at the applicable Contract Unit Bid Price.

3. This payment shall include all costs associated with the installation of the Gate Valves, in place, ready for use.

4. Payment for Gate Valves installed within the meter vault will be considered in the payment for the meter vault.

F. BUTTERFLY VALVES (SECTION 02718)

1. The number of Butterfly Valves installed shall be counted.

2. Payment shall be made at the applicable Contract Unit Bid Price.

3. This payment shall include all costs associated with the installation of the Butterfly Valves, in place, ready for use.

G. HYDROSTATIC TESTING AND WATER MAIN DISINFECTION (SECTION 02510)

1. The results of the Hydrostatic Test and Water Main Disinfection shall be evaluated.

2. Payment for the Hydrostatic Test and Water Main Disinfection shall be made at the applicable Contract Unit Bid Price.

3. This payment shall include all costs associated with performing and completing a passing Hydrostatic Test and successful Water Main Disinfection.

4. No payment shall be made for an incomplete or a failing Hydrostatic Test or unsuccessful Water Main Disinfection as indicated by a failing bacteriological sample.

H. CONNECTION TO EXISTING WATER MAINS (SECTION 02510)

1. The number of Connections to Existing Water Mains shall be counted.

2. Payment for Connections to Existing Water Mains shall be made at the applicable Contract Unit Bid Price.

3. This payment shall include all costs associated with completing a Connection to an Existing Water Main.

I. WATER STORAGE TANK (SECTIONS 03300, 13200, 13205)

1. Payment for the Water Storage Tank shall be made at the Contract Bid Price.

2. A percentage of the lump sum payment may be made with approval of the Owner.

3. This payment shall include all costs associated with completing the earthwork, foundation, piping, erecting, and all other costs associated with the Water Storage Tank.

J. CONTROL WIRE (SECTION 02510)

1. The number of lineal feet of Control Wire installed shall be counted.

2. Payment for the Control Wire shall be made at the applicable Contract Unit Bid Price.

3. This payment shall include all costs associated with installation the Control Wire including conduit, pull boxes, and all other appurtenances, in place, ready for use.

K. CLEARING AND GRUBBING (SECTION 02150)

1. No measurement of clearing and grubbing of the right-of-way will be performed.

2. Payment for clearing and grubbing of the right-of-way will be made at the applicable Contract Unit Bid Price.

3. This payment shall include all costs associated with Clearing and Grubbing the right-of-way.

L. SITE RESTORATION (SECTIONS 02310, 02370, 02910)

1. No measurement of site restoration will be performed.

2. Payment for site restoration will be made at the applicable Contract Unit Bid Price.

3. This payment shall include all costs associated with Site Restoration including final grading, seeding and fertilizing.

M. ROCK EXCAVATION (SECTION 02316)

1. In cases where the Engineer determines that Rock Excavation is necessary, the number of cubic yards of rock excavated shall be measured.

2. Payment for the measured number of cubic yards of rock excavated shall be made at the applicable Unit Bid Price.

3. Payment shall include all costs associated with the excavation and disposal of rock material.

N. WATER REMOVAL (SECTION 02315)

1. In cases where the Engineer determines that water removal by continuous pumping over 150 gpm or with well points is necessary, the number of lineal feet of trench excavation requiring water removal shall be measured along the centerline of the trench.

2. Payment for the measured number of lineal feet of trench excavation requiring water removal shall be made at the applicable Contract Unit Bid Price.

3. This payment shall include all costs associated with mobilization, installation, operation, dismantling and demobilization for water removal.

O. IMPORTED BEDDING (SECTION 02315)

1. In cases where the Engineer determines that native soils are not sufficient for bedding materials, the number of cubic yards of imported bedding shall be measured.

2. Payment for the number of cubic yards of imported bedding shall be made at the applicable Contract Unit Bid Price.

3. This payment shall include all costs associated with imported bedding.

4.02 NONPAYMENT ITEMS

A. CONSTRUCTION SAFETY

1. Construction Safety shall not be paid for separately, but shall be considered as subsidiary to and a part of the cost of the applicable Contract Bid Item.

B. EXCAVATION, BACKFILLING AND COMPACTION

1. Excavation, Backfilling and Compaction shall not be paid for separately, but shall be considered as subsidiary to and a part of the cost of the applicable Contract Bid Item.

C. THRUST BLOCKS/RESTRAINT

1. Thrust Blocks or Restraints shall not be paid for separately, but shall be considered as subsidiary to and a part of the cost of the applicable Contract Bid Item.

D. NUISANCE WATER REMOVAL

1. Nuisance Water Removal shall not be paid for separately, but shall be considered as subsidiary to and a part of the cost of the applicable Contract Bid Item.

E. CLEANUP

1. Cleanup of the job site shall not be paid for separately, but shall be considered as subsidiary to and a part of the cost of the applicable Contract Bid Item.

F. TOOLS

1. Tools necessary to operate fire hydrants, valves and valve boxes shall not be paid for separately, but shall be considered as subsidiary to and a part of the cost of the applicable Contract Bid Item.

G. PIPELINE ASSECORIES

1. Pipeline accessories, including but not limited to couplings, joint materials and marker posts shall not be paid for separately, but shall be considered as subsidiary to and a part of the cost of the applicable Contract Bid Item.

H. CONCRETE

1. Concrete shall not be paid for separately, but shall be considered as subsidiary to and a part of the cost of the applicable Contract Bid Item.

END SECTION 01290

SECTION 01310
PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.01 SUMMARY

A. This section specifies the requirements for managing, coordinating and sequencing the work under the Contract Documents and the requirements regarding existing site conditions.

B. Costs associated with project management and coordination are incidental to the contract work and are included in the contract unit and lump sum costs

1.02 COORDINATION WITH PUBLIC AND PRIVATE AGENCIES

A. Comply with Article 7 of the General Conditions. Permit utility companies to repair or replace their lines in the project limits.

B. Contact the Montana one-call system for utility locations before starting work.

C. Comply with paragraph 6.20 of the General Conditions.

1.03 PRE-CONSTRUCTION CONFERENCE AND PROGRESS MEETINGS

A. Prior to beginning construction, but following contract award, the Contractor, Subcontractors and other interested parties must participate in a Preconstruction Conference in accordance with paragraph 2.8 of the General Conditions.

B. Periodically throughout the contract performance period, the Contractor and Subcontractors shall avail themselves to project progress meetings. Owner shall schedule and hold regular progress meetings at least once a month and at other times requested by the Project Engineer or required by the progress of the work.

C. Representatives from the following shall attend each meeting:

1. Prime Contractor
2. Subcontractors
3. Project Engineer and Inspector
4. Owner’s Representative

D. Contractor is responsible for notifying Subcontractors of meeting time and date.

E. The agenda for each progress meeting shall include at a minimum the following:

1. Review of work progress since last meeting
2. Identification and discussion of problems affecting progress
3. Review of any pending change orders
4. Revision of construction schedule as appropriate

F. Contractor is responsible for recording and distributing the minutes to the participants.

1.04 CONSTRUCTION SCHEDULE

A. Present Project Engineer with a written preliminary construction schedule in the form of a "critical path" diagram or equivalent chart showing the following as a minimum (all times referenced to calendar dates):

1. activity
2. activity description
3. duration
4. early start
5. early finish
6. latest start
7. latest finish
8. total float for that activity

B. Provide enough detail to allow the Project Engineer to evaluate work progress both on-site and off-site.

C. Review of the schedule by the Project Engineer shall not constitute endorsement of the Contractor's approach, means, methods, sequences or procedures nor shall it constitute assignment of the Contractor's responsibility to provide superintendence and project management.

D. Provide the Project Engineer with a revised schedule whenever major changes occur to the schedule.

1.05 WEEKLY ACTIVITY SCHEDULE

A. Provide the Project Engineer with a written weekly activity schedule (facsimile or email is acceptable) indicating planned activities, locations, and approximate schedules.

B. Note the planned visits by manufacturer's representatives, testing firms, or other site visitors that may be of significance to the Project Engineer.

C. Provide the weekly activity schedule to the Project Engineer by noon on the last day of the workweek for activities during the following week.

END SECTION 01310

SECTION 01330
SUBMITTAL PROCEDURE

PART 1 – GENERAL

1.01 SUMMARY

A. This section includes information on submittal procedures and general submittal requirements.

1.02 SUBMITTAL PROCEDURE

A. Submit two (2) copies of submittals to the Project Engineer, unless requested otherwise.

B. Identify each cut sheet or shop drawing with the following information:

1. Contract number

2. Supplier

3. Specification section to which submittal pertains

C. Submit the following information, as applicable, in accordance with the submittal requirements of each section:

1. Manufacturer's cut sheets indicating compliance with references and standards (e.g. applicable ASTM, AWWA standards.

2. Laboratory results, as applicable

3. Dimensional drawings or shop drawings, as applicable.

4. Other specific information required by the particular section of the specification.

D. Variations from Contract Documents or Products Specified:

1. Bring any and all submitted variations to the attention of the Project Engineer.

2. Variations not brought to the Project Engineer's attention, in writing, and that conflict with the Contract Documents, do not relieve the Contractor from the requirements of the Contract Documents.

E. Revisions and Resubmittals:

1. Revise and resubmit submittals as required and identify all changes made since previous submittal.

2. Project Engineer obligations for Resubmittal:

a. The Project Engineer will be obligated to review the original submittal and one resubmittal for each item requiring submittal.

b. Subsequent resubmittals will be at the Contractor's expense, deducted from the subsequent partial pay request and ultimately credited to the Contract via subsequent change order at an hourly rate of $60 per hour.

3. No additional contract time will be given for resubmittals required as a result of the Contractor submitting incomplete or rejected submittals.

F. Submittal Time Requirements:

1. Submit information to the Project Engineer at least three weeks in advance of work to be performed.

2. The Project Engineer will have up to 21 calendar days, from the date received in the Project Engineer's office, to respond to the submittal or resubmittal.

3. If the Project Engineer takes longer than 21 calendar days to respond to a submittal or resubmittal, the Contractor will receive a contract time extension for the number of days in excess of 21 calendar days that the Project Engineer held the particular submittal.

4. Repeated resubmittals resulting in "Rejected" or "Incomplete Submittals" (as defined in Article 1.05) will not be grounds for a contract time extension.

1.03 CONSTRUCTION SCHEDULES

A. Submit to the Project Engineer a progress schedule under Sections 2.6, 2.9 and 6.6 of the General Conditions.

B. Submit to the Project Engineer adjusted progress schedules under Section 6.6 of the General Conditions.

C. Submit to the Project Engineer value schedules under Section 2.6, 2.9 and 6.6 of the General Conditions.

1.04 SHOP DRAWINGS, PRODUCT DATE AND SAMPLES

A. Submit shop drawings to the Project Engineer under Sections 2.6.2 and 6.24 through 6.28 of the General Conditions. Submit all shop drawings for the Contractor, subcontractor(s) and supplier(s).

B. Review all shop drawings prior to submittal in accordance with Section 6.25 of the General Conditions.

C. Submit in writing any substitutions to previously approved items for review by the Project Engineer.

D. Within 15 days after Notice to Proceed, submit a complete list of products proposed for use, providing manufacturer's name, trade name, model or catalog numbers and manufacturer data. Submit the number of copies needed by the Contractor, plus two (2) copies for Project Engineer use.

E. Where specified, submit samples to illustrate functional and aesthetic characteristics of the Product, with integral parts and attachment devices.

F. Where specified, submit samples of finishes including colors, textures and patterns.

1.05 DEFINITIONS

A. Approved: Deemed to be acceptable for use in accomplishing the requirements of the plans and specifications, but does not extend to the means, methods or procedures of construction (except where specific means, methods or procedures are specifically required by the Contract Documents) and does not imply approval of the system or construction in which the submitted item is a part.

B. Conditionally Approved: Deemed to be acceptable for use in accomplishing the requirements of the plans and specifications, if the conditions noted in the submittal approval letter are met. The approval does not extend to the means, methods or procedures of construction (except where specific means, methods or procedures are specifically required by the Contract Documents) and does not imply approval of the system or construction in which the submitted item is a part.

C. Rejected: Deemed unacceptable for the use for which it was submitted.

D. Incomplete Submittal: Information is insufficient to ascertain acceptability. Neither approval or rejection is implied.

PART 2 – PRODUCT, NOT USED

PART 3 – EXECUTION, NOT USED

PART 4 – MEASUREMENT AND PAYMENT, NOT USED

END SECTION 01330

SECTION 01420
REFERENCES

PART 1 – GENERAL

1.01 DEFINITIONS

A. These specifications use "Article 1 – Definitions" of the Standard General Conditions of the Construction Contract, Form No. 1910-8 prepared and issued by the Project Engineer's Joint Contract Documents Committee (EJCDC), for the definition of terms herein. Changes to definitions are by either substitution for the article or in Supplementary Conditions.

1.03 REFERENCES

A. This section lists some of the construction industry organizations, professional and technical associations, societies and institutes, and government agencies issuing, promoting or enforcing standards in the Contract Documents along with the abbreviations commonly used for those references. Also included are general requirements for using industry standards specified and for applying quality control standards.

1.04 USE OF REFERENCE STANDARDS

B. Work specified by reference to a published standard or specification of a government agency, technical association, trade association, professional society or institute, testing agency or other organization must meet or exceed the minimum quality standards for the material and workmanship in the designated standard or specification.

C. Where specified, assure products or workmanship meet the prescriptive or performance requirements in the Contract Documents when it is a more stringent standard than the referenced standard. Contract should reference only one specification to prevent argument as to which specification is <u>most stringent</u>.

D. Where the specific issue date of the standard is not identified in the standard, the edition and all published amendments available on the date of the Invitation to Bid applies.

E. If two or more standards are specified, provide the product and workmanship meeting or exceeding the requirements of the most stringent standard. See section 1.4.2.

F. If a conflict exists between standards, meet the more stringent standard.

G. Where both a standard and a brand name are specified, assure the proprietary product names meet or exceed the specified reference standard. The listing of a trade name in a Contract Document does not warrant that the product meets the referenced standard.

H. Copies of Standards

1. Copies of applicable referenced standards are not bound in this Contract Document.
2. Where the Contractor needs copies of standards for work superintendence and quality control, obtain a copy or copies directly from the publication sources and maintain copies

at the job site, making them available to Contractor personnel, Subcontractors, Owner and Project Engineer.

1.05 ABBREVIATIONS

A. Abbreviations for Trade Organizations and Government Agencies: Following is a list of construction industry organizations and government agencies commonly reference in the Contract Documents, with abbreviations used.

AA	Aluminum Association
AAMA	Architectural Aluminum Manufacturers' Association
AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
AFBMA	Anti-Friction Bearing Manufacturers' Association
AGA	American Gas Association
AGMA	American Gear Manufacturers' Association
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
AITC	American Institute of Timber Construction
ALS	American Lumber Standards
AMCA	Air Moving and Conditioning Association
ANSI	American National Standards Institute
APA	American Plywood Association
API	American Petroleum Institute
AREA	American Railway Engineering Association
ARI	Air Conditioning and Refrigeration Institute
ASAE	American Society of Agricultural Engineers
ASCE	American Society of Civil Engineers
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers, Inc
ASME	American Society of Mechanical Engineers
ASSE	American Society of Sanitary Engineers
ASTM	American Society for Testing and Materials
AWI	Architectural Woodwork Institute
AWPA	American Wood Preservers' Association
AWPB	American Wood Preservers' Bureau
AWPI	American Wood Preservers' Institute
AWS	American Welding Society
AWWA	American Water Works Association
BHMA	Builders Hardware Manufacturers' Association
CBMA	Certified Ballast Manufacturer's Association
CDA	Copper Development Association
CGA	Compressed Gas Association
CISPI	Cast Iron Soil Pipe Institute
CMAA	Crane Manufacturers' Association of America
CRSI	Concrete Reinforcing Steel Institute
FGMA	Flat Glass Marketing Association
FM	Factory Mutual
Fed Spec.	Federal Specifications
FS	Federal Specification

GA	Gypsum Association
HI	Hydraulic Institute
HMI	Hoist Manufacturers' Institute
ICBO	International Conference of Building Officials
ICEA	Insulated Cable Engineers' Association
IEEE	Institute of and Electronics Engineers, Inc
IES	Illuminating Engineering Society of North America
ISA	Instrument Society of America
JIC	Joint Industry Conference of Hydraulic Manufacturers
MIA	Marble Institute of America
Mil. Sp.	Military Specification
MS	Military Specifications
MMA	Monorail Manufacturers' Association
NAAMM	National Association of Architectural Metal Manufacturers
NBHA	National Builders' Hardware Association
NEC	National Electrical Code
NEMA	National Electrical Manufacturers' Association
NESC	National Electrical Safety Code
NFPA	National Fire Protection Association
NHLA	National Hardwood Lumber Association
NLMA	National Lumber Manufacturers' Association
NTMA	National Terrazzo and Mosaic Association
NWMA	National Woodwork Manufacturers' Association
OECI	Overhead Electrical Crane Institute
OSHA	Occupational Safety and Health Act (both Federal and State)
PEI	Porcelain Enamel Institute
PS	Product Standards Section – U.S. Department of Commerce
RLM	RLM Standards Institute, Inc.
RMA	Rubber Manufacturers' Association
SAE	Society of Automotive Engineers
SDI	Steel Deck Institute
SDI	Steel Door Institute
SIGMA	Sealed Insulating Glass Manufacturing Association
SJI	Steel Joist Institute
SMACNA	Sheet Metal and Air Conditioning Contractors National Association
SSPC	Steel Structures Painting Council
SWI	Steel Window Institute
TEMA	Tubular Exchanger Manufacturers' Association
TCA	Tile Council of America
UBC	Uniform Building Code
UFC	Uniform Fire Code
UL	Underwriters' Laboratories, Inc.
WCLIB	West Coast Lumber Inspection Bureau
WWPA	Western Wood Products Association

PART 2 – PRODUCT, NOT USED

PART 3 – EXECUTION, NOT USED

PART 4 – MEASUREMENT AND PAYMENT, NOT USED

END SECTION 01420

SECTION 01430
QUALITY CONTROL / QUALITY ASSURANCE

PART 1 - GENERAL

1.01 SUMMARY

A. This section includes prerequisites and procedures to ensure the quality of the construction and to provide assurance that the Contractor is capable of meeting quality requirements.

B. The intent of all quality control requirements is that the Owner will be provided with a complete, properly functioning system upon completion.

C. The costs for Contractor Quality Control / Quality Assurance measures are incidental to the overall contract and are included in the applicable contract line items.

1.02 CONTRACTOR QUALIFICATIONS

A. The Contractor performing work shall be registered in the State of Montana for the type of construction and magnitude of construction being performed.

1.03 INSTALLER QUALIFICATIONS

A. Work shall be performed under the direct supervision of personnel licensed in the State of Montana for the trade being performed.

1.04 CONTROL OF INSTALLATION

A. Review materials for acceptability when delivered to the site.

B. Store and handle materials to prevent damage.

C. Review materials, services, and workmanship to ensure that work is performed in accordance with the specifications.

D. Comply with manufacturers' instructions.

E. Should manufacturers' instructions conflict with contract documents, request clarification from Project Engineer before proceeding.

F. Correct defective work to the satisfaction of the Project Engineer.

1.05 SAMPLES

A. When requested by the Project Engineer, supply samples of materials proposed for use.

1.06 START-UP

A. Prior to start-up, ensure that all equipment is ready for its use, as designed.

B. Ensure that all power sources are balanced and ready for use.

C. Provide the services of manufacturers' field representative for start-up, testing, and adjustment of all major equipment items.

D. Provide reports from the manufacturer, including their observations and documentation of workmanship to the Project Engineer within 30 days of manufacturer's visit, unless a sooner response is required by the applicable specification section.

E. Work will not be considered complete until all systems and subsystems have been tested for proper functionality and proper adjustment.

1.07 WARRANTY

A. Provide a minimum one (1) year warranty for all materials and labor, covering defects in the materials or deficiencies resulting from contractor installation. Warranty will begin the date the Owner puts the system into use or the date final payment is made, whichever is first.

B. Provide additional warranties as required by specific sections.

PART 2 – PRODUCT, NOT USED

PART 3 – EXECUTION, NOT USED

PART 4 – MEASUREMENT AND PAYMENT, NOT USED

END SECTION 01430

SECTION 01500
TEMPORARY FACILITIES AND CONTROLS

PART 1 – GENERAL

1.01 SUMMARY

A. The work covered by this section includes all temporary facilities and controls needed to complete work under the Contract in a manner that protects public safety and worker safety, that preserves both public and private property and that appropriately involves local governments, emergency and law enforcement.

1.02 RELATED WORK

A. All work under the Contract.

PART 2 – PRODUCTS, NOT USED

PART 3 – EXECUTION

3.01 GENERAL

A. Provide temporary facilities and controls that are necessary to carry out the requirements of the Contract in a manner that:

1. protects public safety and worker safety;
2. preserves both private and public property; and
3. communicates and cooperates with local authorities and governments.

B. The Owner reserves the right to remedy any neglect on the part of the Contractor in regards to the protection of the work and public as follows:

1. The Owner may issue a written notice outlining the Contractor's public safety neglect.
2. The Contractor must respond to and remedy the situation within 24 hours, otherwise the Owner will remedy the situation and deduct any costs from money due the Contractor.
3. In an emergency situation, the Owner may elect to immediately remedy the situation and deduct any costs from money due the Contractor.

3.02 TEMPORARY WATER

A. If there is an existing building or hydrant on the site from which water can be taken, use the available water with the permission of the Owner.

B. If the Owner has water supply mains, but no hydrant is available, make a water main tap and create a service line after obtaining permission from the Owner.

C. If the Owner does not have a water supply, make arrangements to obtain water and pay for it at no direct cost to the project.

D. Cross Connection Control: When connecting to the Owner's water supply, protect the water supply from contamination and provide appropriate backflow prevention devices.

E. Any temporary water connection or use must comply with the requirements of Blackfeet Tribe's Ordinance 98 (water/sewer ordinance), information on this ordinance and requirements can be obtained from Robert DesRosier, Director, Blackfeet Utilities 406-338-7667.

3.03 TEMPORARY SANITARY FACILITIES

A. The Contractor shall provide and maintain a State Department of Health approved chemical toilet for the use of all workers of all trades.

B. Place temporary facilities in an inconspicuous place and keep clean.

C. Remove temporary sanitary facilities at the end of each work day to prevent attracting bears.

3.04 FENCING

A. Protect existing fencing where possible.

B. Repair and replace all moved fencing.

C. Provide adequate fencing for safety purposes.

3.05 BARRICADES & WARNING DEVICES

A. Provide barriers to prevent unauthorized entry to construction areas.

B. Provide barriers to protect adjacent properties from damage.

C. Provide barriers for all trees, shrubs, lawns, etc., not specifically designated for removal by the Project Engineer.

D. Provide barriers to protect all stored materials, the site and structures from damage.

E. Notify local police, fire departments and other emergency programs of any proposed barricading or detouring.

F. Erect and maintain barricades, guardrails, lights and signs as necessary for public convenience and safety.

G. Ensure that barricades remain in place during critical hours.

H. Mark all hazards within the limits of the work or on detours around the work with well-painted, well-maintained barricades, lanterns, torches, flares, reflectors, electric lights, flashers, or caution, warning and directional signs in sufficient quantity and size to adequately protect life and property.

I. Move, change, increase or remove barricades and other safeguards as required during the progress of the work to meet changing conditions.

J. Maintain barricades so they are readily noticed.

K. Comply with "Occupational Safety and Health Act" and local safety requirements, as they apply.

3.06 TRAFFIC CONTROL

A. Conduct all traffic control operations in accordance with the latest issues of the "Manual On Uniform Traffic Control Devices" (MUTCD).

B. Coordinate and obtain approval for all traffic control from local law enforcement.

C. Signs, Signals and Devices

1. Place warning signs in the region of the work.

2. Warn of types of conditions that may be encountered.
   a. Muddy Roads
   b. Slippery Roads
   c. Flagman
   d. Detour
   e. Slow Moving Traffic
   f. Trucks Entering Roadway

3. Traffic Control Signals: Meet the needs of the local government authority.

4. Traffic Cones and Drums, Flares and Lights:
   a. Meet the needs of the local jurisdictions.
   b. Use flares and lights during hours of low visibility to delineate traffic lanes and to guide traffic.
   c. Ensure that flares, lights, etc. remain in position throughout the night.

5. Flagman:
   a. Meet the needs of the local jurisdictions.
   b. Provide trained and equipped flagmen to regulate traffic when construction operations or traffic encroach on public traffic lanes.

D. Haul Routes:

1. Consult with authority having jurisdiction in establishing public thoroughfares to be used for haul routes and site access.

2. Confine construction traffic to designated haul routes.

3. Provide traffic control at critical areas of haul routes to regulate traffic and to minimize interference with public traffic.

E. Removal of Traffic Control

1. Remove equipment and devices when no longer required.

2. Repair damage caused by installation.

3.07 ACCESS ROADS

A. All access roads are shown on plans. These are the only access roads permitted unless otherwise approved by the Owner.

3.08 PARKING

A. Parking vehicles of both the Contractor's and his employees may be done only in the pipeline right-of-way or in another area designated by the Owner.

B. Prevent interference with emergency vehicle functions.

3.09 ROAD SURFACE MAINTENANCE

A. Maintain publicly traveled gravel roads in a condition equal to that at the outset of construction.

1. Fill or grade potholes resulting from construction traffic.

2. Prevent washboarding due to construction traffic.

B. Maintain publicly traveled asphalt roads in a condition equal to that at the beginning of construction, unless being excavated across under this contract.

1. Remove mud and excavated spoils from the roadway at the end of each workday.

2. Sweep all roads at the end of each workday.

3.10 WATER CONTROL

A. Grade site to drain.

B. Maintain excavations free of water.

C. Provide, operate and maintain pumping equipment.

D. Protect site from puddling or running water.

E. Provide water barriers as required to protect site from soil erosion.

3.11 DUST CONTROL

A. Use measures to minimize dust caused by the project.

B. Avoid dust-creating activities during dry, windy conditions.

3.12 PROTECTION OF INSTALLED WORK

A. Protect installed work, and provide special protection where specified in individual specification sections.

B. Provide temporary and removable protection for installed products.

C. Prohibit traffic from landscaped areas.

3.13 SECURITY

A. The Owner will **not** be responsible for security on the site of work.

B. Each Contractor will be held responsible for loss or injury to persons or property where their work is involved.

C. Provide (if deemed necessary) such watchmen and take such other precautionary measures as deemed necessary to protect facilities during the contract period.

3.14 PROGRESS CLEANING

A. Maintain areas free of waste materials, debris and rubbish. Maintain site in a clean and orderly condition.

B. Remove waste materials, debris, and rubbish from site daily and dispose off-site.

3.15 REMOVAL OF UTILITIES, FACILITIES & CONTROLS

A. Remove temporary above grade or buried utilities, equipment, facilities, materials, prior to inspection.

B. Clean and repair damage caused by installation or use of temporary work.

C. Restore existing facilities used during construction to original condition.

3.16 TEMPORARY FIRST AID FACILITIES

A. Provide temporary first aid facilities for employees in sufficient quantity for the number of workers.

3.17 TEMPORARY FIRE PROTECTION

A. Post fire department telephone numbers at the jobsite.

B. Keep fire extinguishers on the job that are appropriate for the type of work being performed.

PART 4 – MEASUREMENT AND PAYMENT, NOT USED

END SECTION 01500

SECTION 01720
STAKING AND CONSTRUCTION SURVEYING

PART 1 - GENERAL

1.01 SUMMARY

A. This section outlines the staking and surveying work related to provide reference points in the field. The section clarifies Project Engineer responsibilities and Contractor responsibilities.

1.02 RELATED WORK

A. Section 02315 – Excavation, Trenching and Backfill for Pipelines

B. Section 02510 – HDPE Water Transmission Mains

1.03 WORK PERFORMED BY THE PROJECT ENGINEER

A. Intake Transmission Water main:

1. The Intake Transmission Water main centerline staking from station 4+00 to station 135+00 will be provided by the Project Engineer, once prior to clearing and grubbing and again following clearing and grubbing.

2. The station of the tees to combination air release/air vacuum valves, butterfly valves, and flush valves will be staked.

3. Staking interval will be 50-feet.

4. Pipeline stakes will consist of 2-foot lengths of ½-inch by 2-inch stakes or of lathe with stationing indicated in black ink marker, unless another agreement is reached between the Project Engineer and Contractor.

5. Temporary benchmarks (TBM) will be provided every 500-feet along the pipeline from station 4+00 to 135+00. The TBM elevation will be written on a stake or lathe adjacent to the reference mark.

B. East Glacier Water main

1. The East Glacier Water main centerline staking from station 142+00 to station 214+30 will be provided by the Project Engineer, once prior to clearing and grubbing and again following clearing and grubbing.

2. The station of the combination air release / air vacuum valves, flush hydrants and gate valves will be staked.

3. The station of the 200,000-Gallon storage tank will be staked.

4. Staking interval will be 50-feet.

5. Pipeline stakes will consist of 2-foot lengths of ½-inch by 2-inch stakes or of lathe with stationing indicated in black ink marker, unless another agreement is reached between the Project Engineer and Contractor.

6. Temporary benchmarks (TBM) will be provided every 500-feet along the pipeline from station 142+00 to 214+30. The TBM elevation will be written on a stake or lathe adjacent to the reference mark.

1.04 CONTRACTOR'S RESPONSIBILITY

A. Notify the Project Engineer at least seven (7) calendar days in advance of the times and places that pipeline staking will be needed.

B. Provide supplementary staking, grade staking, offsets, temporary bench marks, and control points as necessary to complete the work in accordance with the plans and specifications.

C. Reference staking and TBM's needed on the remainder of the waterline alignment shall be provided by the Contractor.

D. Request clarification from the Project Engineer regarding apparent conflicts before proceeding with installation of facilities.

E. Preserve all reference staking placed by the Project Engineer, until such time as the pipeline or other facilities are installed. Reference stakes needing replacement due to Contractor error or negligence to secure the site outside of construction hours must be replaced by one of the following means:

1. a professional land surveyor or engineer hired by the Contractor, or

2. the Indian Health Service engineering staff, at a rate of $900 per day (which covers salaries, vehicle costs, and per diem), credited to the contract.

F. All permanent survey points/markers and bench marks not directly in the line of work shall be preserved, and permanent survey markers disturbed or destroyed, shall be replaced, at the cost of the Contractor, by a hired Professional Land Surveyor registered in the State of Montana. Evidence of reestablishment by a Professional Land Surveyor shall be provided to the Project Engineer.

PART 2 – PRODUCT, NOT USED

PART 3 – EXECUTION, NOT USED

PART 4 – MEASUREMENT AND PAYMENT, NOT USED

END OF SECTION 01720

SECTION 01770
CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes information on closeout procedures and final cleaning.

1.02 RELATED WORK

A. Section 01290 – Measurement and Payment

B. Section 01430 – Quality Control/Quality Assurance

C. Section 01780 – Closeout Submittals

1.03 CLOSEOUT PROCEDURES

A. Pre-Final Inspection:

1. Notify the Project Engineer when and where a preliminary final inspection is desired.

2. Notify the Project Engineer at least five (5) days in advance of the preliminary final inspection.

3. The Project Engineer will provide a written list of deficiencies if a request for such a list is made in writing to the Project Engineer.

4. The preliminary list of deficiencies or preliminary punch list is not considered a complete or final list of deficiencies, and does not relieve the Contractor from completion of the Contract in accordance with the Contract Documents.

B. Substantial Completion Process:

1. Provide the Project Engineer certification that preliminary punch list is complete and that facilities are ready for beneficial use by the Owner.

2. If the Project Engineer concurs, the Project Engineer will document a warranty date for substantially complete facilities.

C. Final Inspection:

1. Submit written certification that work is complete in accordance with contract documents and ready for final inspection at least five (5) calendar days prior to final inspection.

2. Perform and coordinate the final inspection with the Project Engineer, representatives of the Owner and other funding partners (i.e. funding agencies) involved in the project.

3. Final Punch List: Remaining deficiencies will be listed, in a written letter, from the Project Engineer.

4. Provide warranties and record documents (e.g. as-built drawings) to Project Engineer within ten (10) days of final inspection.

D. Final Completion: Final completion will be established once the final punch list deficiencies are remedied and applicable General and Contracting Requirements are met.

E. Submit Record Documents as outlined in Section 6.19 of the General Conditions. Final payment will not be processed until the documents are submitted to and approved by the Project Engineer.

F. Submit, with final payments request, all warranty certificates, lien releases and consent of security forms.

1.04 FINAL CLEANING

A. Complete final clean-up prior to final inspection.

B. Remove waste and surplus materials, rubbish and construction facilities from the site.

PART 2 – PRODUCT, NOT USED

PART 3 – EXECUTION, NOT USED

PART 4 – MEASUREMENT AND PAYMENT, NOT USED

END SECTION 01770

SECTION 01780
CLOSEOUT SUBMITTALS

PART 1 – GENERAL

1.01 SUMMARY

A. This section describes the requirements for closeout submittals including, record drawings, warranty information and general operation and maintenance information.

1.02 RELATED WORK

A. Section 01430 – Quality Control/Quality Assurance

B. Section 01770 – Closeout Procedures

1.03 DELIVERY

A. Provide all closeout submittals meeting these requirements and any specific requirements of each section.

B. All closeout submittals must be received in a correct and complete manner before final payment can be made.

1.04 DEFINITIONS

A. Record Drawing: A drawing showing the actual installation of facilities, showing changes from the plans, and showing detail enough that future persons can readily locate all objects.

B. Ties: Measurements from permanent easily located objects to an installed object.

PART 2 – PRODUCTS, NOT USED

PART 3 - EXECUTION

3.01 RECORD DRAWINGS

A. Provide record data in one of the following manners:

1. On a set of project drawings, neatly draw tie measurements and changes.

2. The Contractor will provide an electronic set of as-built drawing which can be imported into AutoCAD 2002 software.

B. Provide three (3) swing tie measurements to all buried utility objects installed under the contract, that may need to be located in the future, including, but not limited to:

1. Gate valves
2. Butterfly Valves
3. Water main fittings
4. Couplings to existing water systems.

5. Flush Hydrants
6. Utility crossings
7. Combination Air Release/Vacuum Release Valves
8. Control Wire Junction Boxes

C. Provide offset measurements for buried utilities (e.g. water main) installed parallel to roads.

3.02 WARRANTIES

A. Submit all warranty information regarding the materials installed.

B. Minimum warranty information is listed in Section 01430. Specific warranties may be required for each Section of specifications.

3.03 OPERATION AND MAINTENANCE INFORMATION

A. Submit all operation and maintenance information as included in the packaging from the manufacturer regarding the materials installed.

PART 4 – MEASUREMENT AND PAYMENT, NOT USED

END SECTION 01780

SECTION 02150
CLEARING AND GRUBBING

PART 1 - GENERAL

1.01 SUMMARY

A. This work shall consist of clearing, grubbing, removing, burying, chipping, and otherwise disposing of vegetation and debris from areas that must be disturbed within the construction limits except for such objects as are designated to remain or are to be removed in accordance with other sections of these specifications. This work shall also include the preservation from injury of vegetation and objects designated to remain. Clearing and grubbing shall be limited to that area that must be disturbed for construction purposes. All other areas shall not be disturbed. All disturbed areas shall be topsoiled and seeded.

1.02 RELATED WORK

A. Section 02315 – Excavation, Trenching and Backfill for Pipelines

1.03 REFERENCES

A. Environmental Assessment for the Blackfeet Community Water Project

B. Biological Assessment for the Blackfeet Community Water Project

1.04 DEFININTIONS

A. Clearing - Clearing shall consist of the felling of trees and disposal of stumps, brush, windfalls, logs, limbs, sticks, piles of sawdust, rubbish, debris, vegetation and other objectionable matter existing within the clearing limits, as hereinafter defined, or that interfere with excavation or embankment, or the designated clear-vision areas.

B. Grubbing - Grubbing shall consist of the removal from the ground and the disposal of roots, stumps, stubs, together with duff, matted roots, and debris from the grubbing limits, as hereinafter defined.

C. Timber Removal – Timber Removal shall consist of removing all timber, trees or material necessary from the pipeline right-of-way and piling it in a manner such to create dens for wildlife. All timber/brush piles shall be placed randomly on the western side of the right of way. Contractor shall coordinate placement with Owner, contact John Monroe at 406-338-7406 for information.

PART 2 – PRODUCT, NOT USED

PART 3 – EXECUTION

3.01 GENERAL

A. Clearing and grubbing shall be done at such times and in such manner that the surrounding vegetation, adjacent property, and anything designated to remain within the construction limits shall not be damaged. Dragging, piling, disposing of debris, and other work that may

be injurious to vegetation shall be confined to areas that carry no vegetation or that will be covered by embankments or disturbed by excavations.

B. Only trees within the 50-foot right-of-way shall be removed.

C. Anticipated potential hazards, such as “widow makers”, leaning trees (alive or dead), snags, and the like, within the right-of-way shall be close-cut and removed.

D. Grubbing shall be confined to the area over which excavation or surface disturbance is to be actively prosecuted within approximately 30 days following clearing operations. Depressions resulting from grubbing operations shall be made free-draining by backfilling with suitable material or grading to drain. Where scour is likely to occur, temporary erosion control settling basins shall be constructed prior to any scour occurring.

E. Trees which have been removed shall be piled on the west side of the right-of-way, no more than 10 feet high to create dens for the wildlife.

3.02 CLEARING

A. Clearing - Clearing shall be within the 50-foot right-of-way. Only this area may be disturbed for construction.

3.03 GRUBBING

A. Grubbing shall be within 50-foot right-of-way. All stumps, roots, logs, or other timber and all brush, matted roots, and other debris within the area disturbed for construction shall be pulled or otherwise removed to a depth of not less than 12 inches below the original ground surface.

PART 4 – MEASUREMENT AND PAYMENT, NOT USED

END SECTION 02150

SECTION 02310
GRADING

PART 1 - GENERAL

1.01 SUMMARY

A. This section includes rough and finished site grading of all areas disturbed during construction.

1.02 RELATED WORK

A. Section 02315 – Excavation, Trenching and Backfill for Pipelines

B. Section 02370 – Temporary Erosion and Sediment Control

C. Section 02910 – Seeding and Fertilizing

PART 2 – PRODUCTS, NOT USED

PART 3 – EXECUTION

3.01 ROUGH GRADING

A. Grade the area in the vicinity of the excavation to prevent surface water from flowing into the excavation.

B. Maintain Existing Drainage.

3.02 FINISH GRADING

A. Grade site to true grades and/or contours as specified on the plans after all structures and piping have been installed.

B. Grade sites for effective drainage away from structures.

C. Dress and trim all slopes.

D. Round off the tops of slopes and toes of slopes.

E. Place topsoil on all disturbed areas and reseed or sod as soon as possible in accordance with Section 02910 – Seeding and Fertilizing.

PART 4 – MEASUREMENT AND PAYMENT, NOT USED

END SECTION 02310

SECTION 02315
EXCAVATION, TRENCHING AND BACKFILL
FOR PIPELINES AND APPURTENANCES

PART 1 - GENERAL

1.01 SUMMARY

A. This section includes excavation, trenching and backfill necessary for the construction of the facilities as indicated on the plans including, but not limited to: water mains, water main appurtenances, and water storage tank.

1.02 RELATED WORK

A. Section 01500 – Temporary Facilities and Controls
B. Section 01720 – Staking and Construction Surveying
C. Section 01780 – Closeout Submittals
D. Section 2150 – Clearing and Grubbing
E. Section 02310 – Grading
F. Section 02316 – Rock Excavation
G. Section 02317 – Fill
H. Section 02370 – Temporary Erosion And Sediment Control
I. Section 02510 – HDPE Water Transmission Mains
J. Section 02910 –Seeding and Fertilizing

1.03 REFERENCES

A. ASTM D698 – Test Methods for Moisture Density Relations of Soils and Soil-Aggregate Mixtures Using 5.5 lb. Rammer and 12-in. Drop [Standard Proctor Test].
B. ASTM D1556 – Test Method for Density of Soil in Place by the Sand-Cone Method
C. ASTM D2216 – Test Method for Laboratory Determination of Water Content of Soil, Rock and Soil-Aggregate Mixtures
D. ASTM D2487 – Classification of Soils for Engineering Purposes [Unified Soil Classification System].
E. ASTM D2774 – Underground Installation of Thermoplastic Pressure Piping
F. ASTM D2922 – Test Method for Density of Soil and Soil Aggregate and Rock in Place by Nuclear Methods (Shallow Depth)
G. ASTM D3017 – Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)
H. OSHA 1926 – Occupational Safety and Health Standards for the Construction Industry
I. Montana Contractors' Association – Montana Public Works Standard Specifications

1.04 DEFINITIONS

A. Bedding, Haunching and Initial Backfill zones as defined herein and on the standard thermoplastic pipe trench details.

B. Native, Import and Select Material Definitions:

1. Native Material: Soils excavated from the trench in the immediate vicinity of current pipe installation activities.

2. Import Material: Soils transported from a soil pit stockpile at a location other than the location where trench excavation is taking place.

3. Select Material: Portions of native material that, if piled separately from other excavated native materials, could be used for embedment or backfill at that location in accordance with these specifications.

C. Soil Materials as summarized in the table below and further defined in ASTM D2487:

USCS Group	*Description*
GW	Well-Graded Gravel, with less than 5% fines
GP	Poorly-Graded Gravel, with less than 5% fines
SW	Well-Graded Sands, with less than 5% fines
SP	Poorly-Graded Sands, with less than 5% fines
GW-GM or GW-GC	Well-Graded Gravel, with 5-12% fines
GP-GM or GP-GC	Poorly-Graded Gravel, with 5-12% fines
SW-SM or SW-SC	Well Graded Sands with 5-12% fines
SP-SM or SP-SC	Poorly Graded Sands with 5-12% fines

1.05 SUBMITTALS

A. Submit the result of standard proctors, including proctor curve, for each soil type encountered and used on the job.

B. Submit all compaction test results in writing within 5 days of being performed.

1.06 QUALITY ASSURANCE

A. Compaction Testing Qualifications: Tests must be performed by a firm or professional regularly engaged in soil testing for engineering purposes. The individual on site shall be certified to operate nuclear density equipment.

B. Provide compaction test results once per 1,000-feet along the pipeline, at random locations within the 1,000-feet as designated by the Project Engineer.

1. At each location, provide enough tests to demonstrate compliance with the compaction requirements for the pipe embedment zone and the final backfill zone.

2. If testing reveals inadequate compaction, retest at that location after remedying the non-compliance with the specifications.

3. If the Project Engineer requires additional tests and the test fails, the test shall be at the expense of the Contractor.

4. If the Project Engineer requires additional tests and the test passes, the test shall be at the expense of the Owner.

PART 2 – PRODUCTS

2.01 PIPE BEDDING MATERIAL

A. TYPE 1 PIPE BEDDING: Type 1 Pipe Bedding includes the material placed from 4 inches below the bottom of the pipe, around the pipe and up to the springline of the pipe. Provide Type 1 Bedding consisting of sand, sandy gravel or fine gravel having a maximum 1-Inch size and a maximum plasticity index of 6, determined by AASHTO T89 and T90 or by ASTM D4318. Where trench excavation encounters wet or unstable material, Type 1 Pipe Bedding must be free draining and nonplastic. Refer to Standard Drawing 02221-1 and Special Provisions for other requirements.

B. SELECT TYPE 1 BEDDING: Select Type 1 Bedding includes the material placed from the springline of the pipe to 6 inches over the pipe. Select Type 1 Bedding shall consist of soil, sand or fine gravel, free from clods, lumps of frozen material or rock exceeding 1-1/2 inches in its greatest dimension. Excavated trench material may be screened or sorted for use as backfill subject to approval of the Project Engineer. Where trench excavation encounters wet or unstable material, Select Type 1 Bedding must be free draining and nonplastic.

C. PIPE BEDDING ALTERNATE: Pipe Bedding Alternate material is described on Standard Drawing 02221-2, Montana Public Works Standard Specification, and is applicable only if specified in the Contract Documents.

D. TYPE 2 PIPE BEDDING: Type 2 Pipe Bedding is used as directed by the Project Engineer to replace unsuitable material encountered in the trench bottom. Place Type 2 Pipe Bedding from the bottom of the Type 1 Bedding material to the depth required to adequately support the pipe. The Type 2 Bedding consists of granular material meeting the following gradation.

Sieve Opening	% Passing
3-Inch	100
No. 4	0-25
No. 8	0-10

2.02 TRENCH BACKFILL MATERIALS:

A. MATERIALS FROM TRENCH EXCAVATIONS - Backfill material obtained from trench excavations must be free of cinders, ash, refuse, organic or frozen material, boulders or other deleterious materials. Backfill materials and placement are further described in the EXECUTION Section of this specification.

B. IMPORTED BACKFILL MATERIAL - Imported backfill material is from borrow source(s) outside the project limits and is used when, in the opinion of the Project Engineer, an adequate volume of suitable backfill material is not available within the project limits. Imported Backfill Materials must comply with the requirements of Section 2.02, paragraph A, MATERIALS FROM TRENCH EXCAVATION.

PART 3 - EXECUTION

3.01 GENERAL

A. Conform to applicable safety laws, including, but not limited to, OSHA 29 CFR Part 1926.

B. Repair damage resulting from settlement, slides, cave-ins, water pressure, and other causes.

C. Provide traffic control and other temporary provisions in accordance with Section 01500.

3.02 EXCAVATION

A. Remove trees and stumps from excavation and site per Section 02150.

B. Strip and stockpile existing topsoil.

C. Maintain surface drainage away from trenching or excavation.

D. Remove unsuitable foundation materials from excavation as shown on the plans or as authorized by the Project Engineer.

E. Place spoils such that the toe of the spoils pile is at least 2-feet away from the top edge of the trench.

F. Select Material:

1. Select Bedding, Haunching and Initial Backfill: Pile any native material that meets the requirements of article 2.01 paragraph A separately from other excavated soils for use in the pipe embedment zone rather than importing material.

2. Select Final Backfill: Pile any native material that meets the requirements of article 2.02 paragraph B separately from other excavated soils for use as final backfill rather than importing material.

3. Stockpiling and use of select material shall be at no additional cost to the project or Owner, unless hauling further than 200-feet is involved.

3.03 EXCAVATION STABILITY AND SAFETY:

A. The stability of construction excavations and associated worker safety, including slope geometry and shoring/bracing considerations, are the responsibility of the Contractor. Meet current OSHA regulations. This may require design of temporary slopes and/or shoring by a licensed professional engineer.

3.04 TRENCHING

A. Total Bottom Width:

1. Minimum: Pipe diameter plus 12-inches.
2. Maximum: Pipe diameter plus 24-inches.

B. Depth: Provide minimum cover as specified, or depths shown on plans.

C. Top Width: As needed to meet safety requirements, but minimize the width where possible.

D. Trench Walls: Keep trench walls vertical in the pipe embedment zone.

E. Length of Open Trench:

1. Unless authorized by the Project Engineer in writing, the length of trench excavation in advance of pipe being laid shall not exceed 200-feet during active construction.

2. All trenches must be backfilled during non-work hours, or alternately, up to 20-feet of trench can be left open during non-work hours if the trench is completely barricaded and fenced.

3. If open trenches in excess of this specification result in the wetting of moisture-sensitive stockpiled materials, such that the moisture content makes it impossible to meet compaction requirements, the Contractor shall provide imported material that complies with these specifications and haul away the wet materials at no expense to the project or the Owner.

3.05 TRENCH FILLING AND BACKFILLING:

A. GENERAL - Backfill all trenches as specified immediately after grade, alignment and pipe jointing has been inspected and approved by the Project Engineer. Conduct any pipe testing as specified in the respective water distribution section. Correct all defects discovered by tests. Do not water jet or pond any bedding or backfill materials. Limit water in the backfill material to that required to provide adequate moisture for compaction.

B. PIPE BEDDING PLACEMENT:

1. Type 1 Pipe Bedding - Place Type 1 Pipe Bedding material 4 inches under the pipe, around the pipe and up to the springline of the pipe. Place in maximum lifts of 6 inches, using hand or other compaction methods without damaging or disturbing the pipe. Thoroughly compact each layer. Use special care to assure compaction under the pipe haunches. Place Type 1 Bedding material in equal lifts on both sides of the pipe for the full trench width. Take care to prevent migration of Type 1 Bedding into surrounding soils during placement and compaction.

2. Select Type 1 Pipe Bedding - Place Select Type 1 Bedding material from the springline to 6 inches over the pipe. Where wet or unstable material exists, assure the material is free draining and nonplastic. Place in maximum lifts of 6 inches using hand or other compaction methods without damaging or disturbing the pipe. Thoroughly compact each layer. Place Select Type 1 Bedding in equal lifts on both sides of the pipe for the full trench width. Take care to prevent migration of Select Type 1 Bedding into surrounding soils during placement and compaction.

3. Type 2 Pipe Bedding - Use Type 2 Pipe Bedding described in PRODUCTS, Article 2.01, paragraph D as specified or as directed by the Project Engineer to replace unsuitable

material encountered in the trench bottom, placing it from the bottom of the TYPE 1 Bedding material to the depth required to adequately support the pipe.

C. TRENCH BACKFILL

1. After the pipe bedding materials are placed and compacted as specified, backfill the trench. Use backfill material free of cinders, ash, refuse, organic or frozen material, boulders or other deleterious materials. From the top of the Select Type 1 Pipe Bedding to 6 inches below the ground surface, or the subgrade elevation, material containing rock up to 8 inches in the greatest diameter may be used.

2. Trench backfill from the top of the pipe bedding to ground surface or the street subgrade is separated into three classifications. Type A Trench Backfill is compacted backfill typically used in streets or paved areas. Type B Trench Backfill is typically used for alleys, cultivated streets, borrow pits, unimproved streets or other un-surfaced areas, and other areas where compaction is less critical. Type C Trench Backfill is typically used in open and unimproved areas outside of the public right-of-way. Meet the backfill and compaction requirements for all of the backfill types described in the Contract Documents.

3. Remove, replace and re-compact backfill in trenches where settlement has occurred as directed by the Project Engineer at the Contractor's expense.

    a. Type A Trench Backfill - Place trench backfill in maximum 8-inch compacted lifts within 3 percent of optimum moisture content and compact to at least 95 percent of maximum dry density determined by AASHTO T99 or by ASTM D698.

    b. Type B Trench Backfill - Place trench backfill in maximum 8-inch compacted lifts within 3 percent of optimum moisture content and compact to at least 90 percent of maximum dry density determined by AASHTO T99 or by ASTM D698. Cultivated areas are to be backfilled with Type B Trench Backfill.

        i. In cultivated areas, place stripped topsoil uniformly over the backfilled trench to the original depth. Do not compact the topsoil, but grade to provide a smooth surface conforming to the adjoining ground surfaces. Remediate any settlement of the trench surface below final surface grade throughout the contract warranty period.

    c. Type C Trench Backfill - Place and compact Type C Trench Backfill in maximum 12-inch lifts at densities equal to or greater than the densities of adjoining undisturbed soil. Mound earth over the trench top, if so directed by the Project Engineer.

4. REPLACEMENT OF UNSUITABLE BACKFILL MATERIALS

    a. Remove and dispose of excavated soils that are saturated, contain deleterious materials or have characteristics that, in the opinion of the Project Engineer, render the soils unsuitable as backfill. Replace unsuitable soils with material obtained from trench excavations within the project limits at the expense of the Contractor. If suitable replacement material is not available within the project limits, obtain material from an approved borrow source, to be paid for as Imported Backfill

Material. Place and compact all imported material according to the applicable backfill specification requirements.

5. BACKFILL FOR APPURTENANCES

a. Place and compact backfill for appurtenances to finished grade around manholes, inlets, valve boxes and other underground items without disturbing appurtenance alignments. Meet the backfill material, placement and compaction requirements specified for the adjoining trench.

3.07 DRAINAGE AND CREEK CROSSINGS

A. The pipeline will cross two creeks and several drainages. The creeks and drainages typically flow only during spring runoff or heavy rain events.

B. The drainage and creek crossings shall be performed in accordance to the Department of the Army Nationwide Permit 12, which as been issued to the Blackfeet Tribe for this Project. The conditions of the permit may be viewed at http://www.usace.army.mil/inet/functions/cw/cecwo/reg/nwpcond.htm. In addition to the nationwide permit, the Corp requires all drainage crossings be made when the drainages are dry. The Blackfeet Environmental Office shall be contacted to verify that the drainage is dry.

C. The Contractor shall erect silt fences and take erosion control measures to protect the creek and drainage channel and also to protect the water quality of receiving streams.

D. Once the creek or drainage has been crossed, the creek and drainage channels shall be returned as near as possible to its original state.

3.08 REMOVAL OF NUISANCE WATER

A. Remove nuisance water entering the trenches. Water that can be removed through the use of sump or trash pumps (less than 150 GPM) will not be considered dewatering.

B. Keep trenches free from water until the facilities are in place, sealed against the entrance of water, and backfill has been placed and compacted above the water level.

3.09 LOCATE EXISTING UTILITIES

A. Field locate all existing underground utilities.

1. Utilize state “utility locate” hotlines.

2. Contact all other utility owners not covered by the state “utility locate” hotlines.

3.10 UTILITY CONFLICTS

A. Protect existing utilities from damage during excavation and backfilling operations.

B. Provide temporary support for existing water, gas, telephone, power, or other utility services that cross the trench until backfilling of trench is complete.

1. Compact backfill to 95% of maximum density under disturbed utilities.

2. Repair or replace any damaged existing utilities, at no additional cost to the project or Owner.

C. Water and sewer parallel and perpendicular crossings:

1. Maintain a 10-foot horizontal separation (O.D. to O.D.) for parallel mains.

2. Upon approval by the Project Engineer, water and sewer mains may be installed in parallel as close as 5-feet, provided all of the following conditions:

   a. Vertical separation is 18 inches (O.D. to O.D.)
   b. Water main is above the sewer main.
   c. Sewer pipe is constructed to withstand 150 psi static pressure without leaking.

3. Maintain a minimum 18-inch vertical separation (O.D. to O.D.) for perpendicularly crossing mains.

   a. Place water pipe over sewer pipe.
   b. Lay pipe with joints equidistant from the point of crossing.

4. If it is impossible to meet any of the above separation distances and deviations, one of the following methods shall be adhered to.

   a. Sewer main shall be constructed to water main pressure pipe standards, and successfully pass a 150-psi pressure test prior to backfilling.

   b. Either the water main or the sewer main may be encased in a watertight carrier pipe that extends 10-feet on both sides of the crossing. The carrier pipe shall be of material designed for use in water main construction.

PART 4 – MEASUREMENT AND PAYMENT, NOT USED

END SECTION 02315

SECTION 02316
ROCK EXCAVATION

PART 1 - GENERAL

1.01 SUMMARY

A. This section includes rock excavation necessary for the construction of the facilities as indicated on the plans.

1.02 RELATED WORK

A. Section 02315 – Excavation, Trenching and Backfill

1.03 SUBMITTALS

A. Contractor's blasting license and/ or blasting permit.

1.04 DEFINITION

A. Solid Rock

1. Large masses of rock which, in the opinion of the Project Engineer, cannot be excavated without drilling, blasting, ripping equipment or other specialized equipment.

B. Loose Rock

1. Boulders and other detached stones each having a volume of 1-cubic yard or more.

1.05 RESPONSIBILITIES

A. Comply with laws, ordinances, applicable safety code requirements and regulations relative to the handling, storage, and use of explosives.

B. Blasting Contractor shall be licensed by the State of Montana.

C. Secure necessary permits and submit to Project Engineer.

D. Protect adjacent utilities lines, property, and structures from blasting operation.

E. Repair damage caused by rock excavation operations.

F. Remove excavated rock from site unless otherwise directed by the Project Engineer.

PART 2 – PRODUCT, NOT USED

PART 3 – EXECUTION

3.03 ROCK MEASUREMENT

A. Determine rock profile by one of four methods:

1. Excavating and exposing the rock, prior to blasting.

2. Drilling prior to excavating and blasting.

3. Blasting and excavating, then measuring rock. Note: 20% reduction in rock volume shall be factored in to account for expansion.

4. Water displacement: A large container of known inside dimensions shall be filled with water to the rim. The boulder or rock shall be placed in the container and then removed. The displaced water shall be determined by measuring the drop in water level after removing the rock. Water accidentally removed by the excavator bucket will not count toward rock volume.

B. Measure solid rock to the nearest 0.1 foot from the surface and no less than every ten feet along the rock profile.

1. Trenches

a. Rock volume measurements shall be based on the surface profile, to a point 6-inches below the invert of the pipe and 12-inches from each side of the pipe or appurtenance with a maximum 30-inch trench width allowed for measurement purposes.

2. Structures

a. Rock volume measurements shall be based on a point 6-inches below the structure and 24-inches from the edges, horizontally.

C. Measure quantity of loose rock in cubic yards.

3.02 EXCAVATION

A. Excavate a minimum 6 inches deeper than the pipe invert.

B. Refill trench to the required elevation with material in accordance with Section 02315 – Excavation, Trenching and Backfill.

3.03 BLASTING

A. Blast in accordance with OSHA guidelines.

B. Comply with conditions of blasting permit.

PART 4 – MEASUREMENT AND PAYMENT, NOT USED

END SECTION 02316

SECTION 02317
FILL

PART 1 - GENERAL

1.01 SUMMARY

A. This section addresses the material requirements and requirements for placement and compaction for both on-site fill and imported fill.

B. This section addresses fill for embankments and general earthwork as well as structural fill.

1.02 REFERENCES

A. ASTM C136 – Method for Sieve Analysis of Fine and Coarse Aggregates

B. ASTM D698 – Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf / ft^3)

C. ASTM D1556 – Test Method for Density of Soil in Place by the Sand-Cone Method

D. ASTM D2216 – Test Method for Laboratory Determination of Water Content of Soil, Rock and Soil-Aggregate Mixtures

E. ASTM D2922 – Test Method for Density of Soil and Soil Aggregate and Rock in Place by Nuclear Methods (Shallow Depth)

F. ASTM D3017 – Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)

1.03 SUBMITTALS

A. 13 lb Sample and gradation of imported fill materials.

B. Proctor curve with maximum density and optimum moisture content indicated.

C. Field density and moisture test results.

1.04 DEFINITIONS

A. Engineered Fill: Fill or embankment of soil in areas other than that underneath structures.

B. Structural Fill: Fill underneath structures.

PART 2 - PRODUCTS

2.01 ON-SITE AND IMPORTED FILL MATERIAL REQUIREMENTS

A. Free from roots, debris, large stones, organic and other deleterious materials.

B. Limit the maximum particle size to 2/3 of the layer being placed.

C. Material consisting of crushed, partially crushed or naturally occurring granular material.

2.02 IMPORTED FILL MATERIAL

A. Option #1:

	Percent Passing (by weight)	
Sieve Size	Base Course Material	Top Course Material
1¼ " Square	100	---
5/8" Square	50 – 80	100
¼" Square	30 – 50	55 – 75
U.S. No. 40	3 – 18	8 – 24
U.S. No. 200	0 – 7.5	0 – 10
Percent Fracture	75 minimum	75 minimum

B. Option #2: with maximum particle size limited to 2/3 of the depth of the layer being placed.

Sieve Size	Percent Passing
¼" Square	25 –100
U.S. No. 200	0 – 10

2.03 STRUCTURAL FILL

A. Standard Structural Fill: Crushed Material

	Percent Passing (by weight)	
Sieve Size	Base Course Material	Top Course Material
1¼ " Square	100	---
5/8" Square	50 – 80	100
¼" Square	30 – 50	55 – 75
U.S. No. 40	3 – 18	8 – 24
U.S. No. 200	0 – 7.5	0 – 10
Percent Fracture	75 minimum	75 minimum

B. Alternate Material:

		Percent Passing (by weight)
Sieve	Class A Foundation Mat'l	Class B Foundation Mat'l
2 ½ " Square	98 – 100	95 – 100
2" Square	92 – 100	75 – 100
1 ½ " Square	72 – 87	30 – 60
1 ¼" Square	58 – 75	0 – 15
¾" Square	27 – 47	0 – 1
3/8" Square	3 – 14	---
U.S. No. 4	0 – 1	---

PART 3 - EXECUTION

3.01 PREPARATION

A. Clear and grub as specified.

B. Strip and stockpile topsoil and / or organic material.

C. Backfill all depressions or holes below the ground surface with imported fill, whether caused by stripping or otherwise, to the ground surface prior to commencement of filling activities.

D. Scarify the area onto which the fill is being placed to a depth of 6-inches.

3.02 PLACEMENT AND COMPACTION

A. Construct fills and embankments at the locations and to the lines, grades and/or typical sections indicated on the plans.

B. Lift (layer) Thickness:

1. Top 2-feet of Fill: 4-inches maximum (before compaction)

2. Below the Top 2-feet of Fill:
   a. 18-inches (before compaction) if the specified density can be achieved throughout the thickness of the layer and if vibratory compaction equipment is used.
   b. 8-inches (before compaction) if the specified density cannot be achieved throughout the thickness of the layer.

C. Required Densities:

1. Top 2-feet of Fill: 95% of Maximum Density

2. Below the Top 2-feet of Fill: 90% of the Maximum Density

D. Moisture Content Limitations:

1. Maximum: 3% in excess of the optimum determined by Modified Proctor (ASTM D1557), unless the material is free draining gravel or sand with less than 5% fines (passing No. 200 sieve) or if the moisture will not impair the embankment's integrity and soil density.

2. Minimum: As necessary to meet the required density.

3. Moistening, drying or protecting the moisture content shall be incidental to the work, and the cost of such activity shall be included in the bids.

3.03 STRUCTURAL FILL REQUIREMENTS

A. Provide a minimum of 6-inches of imported material underneath structures, unless otherwise indicated on the plans.

B. Within 3-inches of the structure, use only material meeting article 2.03, paragraph A.

C. Follow placement and compaction requirements of article 3.02.

3.04 TESTING AND REPORTING REQUIREMENTS

A. Establishing Maximum Density Values:

1. Proctor Tests: When soils have 30% or less by mass retained on the ¾-inch (19.0-mm) sieve, use the standard proctor test (ASTM D698 or AASHTO T99).

2. Frequency: Provide laboratory results for maximum density and optimum moisture for every 4,000 cubic yards of fill (on-site fill or imported fill) or for every change of borrow pit, whichever is more frequent.

B. Gradation Analyses: Provide gradation analyses, in accordance with ASTM C136, for every 4,000 cubic yards of fill (on-site fill or imported fill) or for every change of borrow pit, whichever is more frequent.

C. Field Density and Moisture Tests:

1. Method: Test using Nuclear Field Density methods, according to ASTM D2922 and D3017, or by the sand cone method, ASTM D1556.

2. Frequency and Location: Test in locations as requested by the Project Engineer. Approximate frequency will be as follows:

a. Imported Fill: 1 per 1,000 cubic yards, minimum.
b. Native Fill: 1 per 1,000 cubic yards, minimum.

3. Perform the field density tests at the time of placement of material. If the testing equipment or testing firm is unavailable, leave the area exposed for testing until such time as the test is performed.

4. If a test reveals inadequate compaction, the Contractor shall remedy the compaction deficiency and provide additional tests to show compliance. The costs of additional tests shall be the Contractor's responsibility.

5. Reporting: Supply the results of the field density and field moisture tests to the Project Engineer within 5 working days of the request for the test or within 5-days of the work at the location of the test.

D. Access to Work and Materials: Allow access to materials and to work for the purposes of testing and determining compliance with the fill placement requirements, and make provisions in bids to allow for such activities.

PART 4 – MEASUREMENT AND PAYMENT – NOT USED.

END SECTION 02317

SECTION 02370
TEMPORARY EROSION AND SEDIMENT CONTROL

PART 1 - GENERAL

1.01 SUMMARY

A. This section includes erosion and siltation control measures accomplished through the use of interception embankments, berms, dikes, dams, silt fences, settling basins, slope paving, ditch checks, rip-rap, mulches, erosion mats, and other erosion control devices or methods.

1.02 RELATED WORK

A. Section 02310 – Grading
B. Section 02315 – Excavation, Trenching and Backfill
C. Section 02910 – Seeding and Fertilizing

1.03 REFERENCES

A. Environmental Protection Agency - 1987 Congressional Amendments, Clean Water Act, Section 402.

1.04 SUBMITTALS

A. Silt fence material, (or alternate erosion control material proposed).

B. Pollution Prevention Plan as required by the EPA's National Pollutant Discharge Elimination System (NPDES) Permit. Ms. Kari Sawyer, Blackfeet Environmental Office, (406)338-7421 should be contacted to assure all applicable permits have been obtained.

1.05 QUALITY ASSURANCE

A. Erosion control materials, methods and practices shall conform to the US EPA Clean Water Act storm water rule for construction programs.

B. Obtain and pay for permits and inspections in accordance with the provisions of all local government agencies having jurisdiction. All permit fees or fines resulting from lack of compliance are the Contractor's responsibility.

PART 2 - PRODUCTS

2.01 POSTS

A. Wood or steel, 2" x 2" x 54" minimum.

2.02 SILT FENCING

A. 15 mil thick screen fabric with a minimum of 120 pounds of grab tensile strength and an equivalent minimum opening size of 170.

B. All seams shall be heat sealed or sewn

2.03 EROSION FIBER LOGS

A. Made of aspen excelsior barbed, curled wooden fibers inside a tube of polyester netting.

B. Acceptable Products: Equal to American Excelsior Sediment Log

PART 3 – EXECUTION

3.01 GENERAL

A. The Contractor shall develop a Pollution Prevention Plan and shall submit the plan to the Blackfeet Environmental Office. The Contractor shall adhere to the requirements of the plan.

B. The Blackfeet Environmental Office will assist the Contractor in developing the Pollution Prevention Plan.

C. Information regarding the requirements of the Pollution Prevention Plan may be obtain via the EPA's website, http://cfpub.epa.gov/npdes/stormwater/const.cfm?program_id=6.

PART 4 – MEASUREMENT AND PAYMENT, NOT USED.

END SECTION 02370

SECTION 02510
HDPE WATER TRANSMISSION MAIN

PART 1 - GENERAL

1.01 SUMMARY

A. This section includes the installation of water mains, valves, hydrants and other appurtenant structures for community water systems.

1.02 RELATED WORK

A. Section 01500 – Temporary Facilities and Controls
B. Section 02315 – Excavation, Trenching and Backfill for Pipelines
C. Section 02718 – Water Valves and Hydrants

1.03 REFERENCES

A. ANSI/AWWA C104/A21.4 – Cement-Mortar Lining for Ductile Iron Pipe and Fittings for Water

B. ANSI/AWWA C110/A21.10 – Ductile Iron and Gray Iron Fittings, 3 Inch Through 48 Inch, for Water and Other Liquids

C. ANSI/AWWA C111/A21.11 – Rubber-Gasket Joints for Ductile Iron and Gray Iron Pressure Pipe and Fittings

D. ANSI/AWWA C153/A21.53 – Ductile Iron Compact Fittings, 3 Inch Through 16 Inch, for Water and Other Liquids

E. ANSI/AWWA C651- Disinfecting Water Mains

F. AWWA C906-99 - Standard for Polyethylene (PE) Pressure Pipe and Fittings, 4-inch Through 63-inch, for Water Distribution and Transmission

G. Plastics Pipe Institute, Incorporated – Handbook of Polyethylene Pipe

H. Standard Methods for Examination of Water and Wastewater

1.04 SUBMITTALS

A. Water Transmission Main and Fittings
B. Pipe Fusing Equipment
C. Transmission Main Couplings
D. Warning Tape
E. Control Wire, Box, and Splice Materials
F. Method of Disinfection
G. Water Testing Lab
H. Method of Connection to Existing Pipelines

1.05 DEFINITIONS

A. Fully Restrained: A fully restrained joint is one in which the pipe yields before the joint disjoins.

1.06 QUALITY ASSURANCE

A. Water testing shall be done by a State certified laboratory.

B. All transmission pipe material on the job must be from one manufacturer, unless the Project Engineer approves an exception in writing.

C. Do not lay pipe when trenches or weather conditions are not suitable for such work.

1.07 ACCEPTANCE

A. Work covered by this section will not be accepted until the backfilling and testing related with the work has been completed satisfactorily.

B. Any section of water main that is found defective in material, alignment, or joints shall be corrected to the satisfaction of the Owner.

PART 2 - PRODUCTS

2.01 WATER TRANSMISSION PIPE AND FITTINGS

A. Three inches or smaller – Pipe shall be manufactured from a PE 3408 resin listed with the Plastic Pipe Institute (PPI) as TR-4. The resin material will meet specifications of ASTM D3350-99 with a cell classification of PE:345464C. Pipe shall have a manufacturing standard of ASTM D2737 (CTS). Pipe shall be DR 9 (200 psi WPR) unless otherwise specified on the plans. The pipe shall contain no recycled compounds except that generated in the manufacturer's own plant from resin of the same specification from the same raw material. All pipes shall be suitable for use as pressure conduits, and per AWWA C901, have nominal burst values of three times the Working Pressure Rating (WPR) of the pipe. Pipe shall also have the following agency listing of NSF 14.

B. Four Inches and larger – Pipe shall be manufactured from a PE 3408 resin listed with the Plastic Pipe Institute (PPI) as TR-4. The resin material will meet the specifications of ASTM D3350-99 with a cell classification of PE:345464C. Pipe shall have a manufacturing standard of ASTM F714. Pipe O.D. sizes 4" to 24" shall be steel pipe size (IPS). Pipe shall be DR 15.5 (110 psi WPR) or DR 11 (160 psi WPR) as indicated on the plans. The pipe shall contain no recycled compounds except that generated in the manufacturer's own plant from resin of the same specification from the same raw material. All pipes shall be suitable for use as pressure conduits, listed as NSF 14. Peak flow water velocity of 5 ft/sec shall be used in the hydraulic design.

C. Fittings

1. Ductile and Gray Iron Fittings: AWWA C110 and AWWA C111
2. Ductile Iron Compact Fittings: AWWA C153
3. Lining: Cement-Mortar per AWWA C104

4. Thrust/Restraint
   a. Special anchoring retainer glands for iron mechanical joint fittings connecting to iron pipe:
      i. EBAA Iron Megalug
      ii. Romac Industries Grip Ring
      iii. Tyler Pipe MJR

   b. Mechanical Joint Restraint Rodding ("shackle rods"):
      i. 3/4 inch mild steel threaded rods
      ii. Tie bolts
      iii. Duc lugs

   c. HDPE Electrofusion Flex Restraints – Concrete encasement utilizing Electrofusion Flex Restraints.

5. Butt Fusion Fittings – Fittings shall be PE 3408 HDPE, Cell Classifiction of 345464C as determined by ASTM D3350-99, and approved for AWWA use. Butt Fusion Fittings shall have a manufacturing standard of ASTM D3261. Molded and fabricated fittings shall have a pressure rating equal to the pipe unless otherwise specified on the plans. Fabricated fittings are to be manufactured using Data Loggers. Temperature, fusion pressure and a graphic representation of the fusion cycle shall be part of the quality control records. All fittings shall be suitable for use as pressure conduits, and per AWWA C906, have nominal burst values of three and one-half times the Working Pressure Rating (WPR) of the fitting.

6. Electrofusion Fittings – Fittings shall be PE3408 HDPE, Cell Classification of 345464C as determined by ASTM D3350-99. Electrofusion Fittings shall have a pressure rating equal to the pipe unless otherwise specified on the plans. All electrofusion fittings shall be suitable for use as pressure conduits, and per AWWA C906, have nominal burst values of three and one-half times the working pressure (WPR) of the fitting.

7. Internal stainless steel stiffeners shall be equal to Victaulic Style 995.

2.02 WARNING TAPE

A. Supply detectable warning tape that is a minimum of 2 inches wide, blue or striped blue, and has printing that warns of a water line below.

2.03 CONTROL WIRE AND BOX (Water Plant to East Glacier Tank)

A. Wire: 24 pair, 12 AWG (65 X #30) Tinned Copper, PVC Insulation Overall Beldfoil Shield, 14 AWG (19 X #27) Tinned Copper Drain Wire, PVC Jacket with ripcord.

B. Conduit and Pull Boxes: The conduit shall be 2-1/2 inch PVC schedule 40 suitable for direct bury in accordance with the National Electric Code. Pull boxes shall be molded plastic and sized in accordance with the National Electric Code. Pull boxes shall be mounted on treated posts as shown in the details of the plans. All fittings shall also be in accordance with the National Electric Code.

C. Splices: Splicing wire shall be avoided. If the Engineer determines a splice is necessary, it shall be done utilizing waterproof splice materials.

2.04 CONTROL WIRE AND PULL BOXES (Intake to Water Plant)

A. Wire: 16 pair, 12 AWG (65 X #30) Tinned Copper, PVC Insulation Overall Belfoil Shield, 14 AWG (19 X #27) Tinned Copper Drain Wire, PVC Jacket with ripcord.

B. Conduit and Pull Boxes: The conduit shall be 2-1/2 inch PVC schedule 40 suitable for direct bury in accordance with the National Electric Code. Pull boxes shall be molded plastic and sized in accordance with the National Electric Code. Pull boxes shall be mounted on treated posts as shown in the details of the plans. All fittings shall also be in accordance with the National Electric Code.

C. Splices: Splicing wire shall be avoided. If the Engineer determines a splice is necessary, it shall be done utilizing waterproof splice materials

PART 3 - EXECUTION

3.01 GENERAL

A. Perform trench excavation, bedding of main and appurtenances and backfilling activities in accordance with Section 02315.

B. Maintain separations from existing utilities in accordance with Section 02315.

3.02 DELIVERY, STORAGE AND HANDLING

A. Ensure that pipe is free from defects and damage at time of delivery and prior to installation in the trench. Pipe with gouges or scratches deeper than 10% of the wall thickness will be considered damaged / defective.

B. Remove all defective pipe from the site within 24-hours of discovery.

C. Protect pipe with padding between metal machinery and pipe when handling.

D. Keep dirt and foreign matter away from pipe interiors and sealing surfaces.

3.03 WATER TRANSMISSION MAIN INSTALLATION

A. Install water mains and appurtenances in the locations and of the sizes and materials shown on the drawings and bid schedule.

B. HDPE Pipe Cold Bending:

1. Allowable Minimum Cold Bending Radius:
   a. 50-feet if not near a fitting or joint.
   b. 100-feet if near a fitting or joint.
   c. Make necessary provisions to ensure that localized curvature is within the tolerances in 3.03 B.1.a and 3.03 B.1.b over the length of curve.
   d. For tighter curve requirements, use prefabricated HDPE fittings of the same DR and OD as the pipe.

C. HDPE Joints:

1. Sections of polyethylene pipe should be joined into continuous lengths on the jobsite above ground. The joining method shall be the butt fusion method and shall be performed in strict accordance with the manufacturer's recommendations. The butt fusion equipment used in the joining procedures should be capable of meeting all conditions recommended by the pipe manufacturer, including, but not limited to, temperature requirements of 400^{o}F, alignment, and joint weld strength equal to or greater than the tensile strength of the pipe itself. All welds will be made using a Data Logger to record temperature, fusion pressure, with a graphic representation of the fusion cycle shall be part of the Quality Control records.

2. Sidewall fusion for connections to outlet piping shall be performed in accordance with HDPE pipe and fitting manufacturer's specifications. The heating irons used for sidewall fusion shall have an inside diameter equal to the outside diameter of the HDPE pipe being fused. The size of the heating iron shall be ¼ inch larger than the size of the outlet branch being fused.

3. Mechanical joining will be used where the butt fusion method can not be used. Mechanical joining will be accomplished by either using a HDPE flange adapter with a Ductile Iron back-up ring or HDPE Mechanical Joint adapter with a Ductile Iron back-up ring.

4. Socket fusion, hot gas fusion, threading, solvents, and epoxies will not be used to join HDPE pipe. Socket fusion may only be used for the connection to the combination air release/air vacuum valve.

D. Ensure that ends of pipe in the trench are plugged at all times to prevent soil, rodents and trench water from entering the pipeline. Pipelines left open will have to be poly-pigged and flushed at the Contractor's expense.

E. Install pipe with a minimum bury depth of 6 feet, measured from finished grade to top of pipe or at a depth indicated on the plans.

F. HDPE to Fittings and Valves: Use flanged connections for **all** HDPE to iron pipe (ductile or cast) fittings.

G. Install thrust restraint on all fittings and appurtenances. Contractor's option of the following thrust restraints unless specifically noted on the plans:

1. Special Anchoring Retainer Glands:
   a. Install in accordance with manufacturer's recommendations.
   b. Fully restrain all joints within 20-feet of a fitting with appropriate restraint.
   c. Project Engineer may specify that an additional restraint be used for pipe sections near critical fittings.

2. Joint Restraint Rodding ("shackle rods"):
   a. Rod from fitting to fitting where restrained fittings are required.
   b. Install tie bolts to connect tie rods, if required.
   c. Install duc lugs where required to increase the width of the rodding.
   d. Paint rods and hardware with two coats of bituminous coating.

H. Install HDPE Electrofusion Flex Restraints as indicated on the plans.

3.04 WARNING TAPE INSTALLATION

A. Install warning tape in water main trench 1-foot below finish grade, centered over the pipeline.

3.05 CONTROL WIRE INSTALLATION

A. Install with all HDPE pipe.

B. Install the control wire in the initial backfill layer 6-inches above and along the pipe centerline.

C. Avoid underground splices, but where necessary, make splices with an underground, waterproof splice kit.

D. Provide pull boxes every 600 feet.

E. Install junction box at a location that will not interfere with operation and maintenance of the hydrant or ARV.

3.06 PRESSURE TESTING

A. Whenever practical, before backfill is placed or joints covered, test pipe for leaks.

B. Furnish necessary material, equipment, and labor for testing including, but not limited to: water, pump, water storage vessel, piping, pressure gauge, valve, hydrant, and corporation stop.

1. Pressure gauge shall be liquid filled with 5 psi or less increments.

2. Volume measurement equipment shall be a water meter registering 1 gallon per sweep of the hand with a $1/10^{th}$ gallon totalizer or a graduated container.

3. Pump shall be of a design that limits introduction of air. Defective equipment shall be replaced.

C. Test mains and have equipment fully prepared prior to calling the Project Engineer or his representative on site to witness the passing of a test.

D. A separate test shall be performed for each section of pipe between valves.

E. Testing Procedure:

1. Slowly fill test section with water at a velocity below 1 ft/sec. The 12-inch main shall require potable water and the 20-inch main may utilize water from the Lower Two Medicine Reservoir.

2. Expel air from the test section.

3. Pressurize the main to 1.5 times the designed system working pressure or to the pipe's pressure rating, whichever is less, based on the low point in the section being tested. The required test pressure at the gauge location shall be adjusted to reflect the required pressure at the low point.

4. Initial Expansion: Allow the pipe to expand for 3 hours, during which pressure is maintained at the required test pressure.

5. Test Period: Following initial expansion, bring pressure to the required pressure and hold for 2-hours; monitor and measure necessary make-up water added during the 2-hours.

6. If pressure drops more than 5 psi during the test period, immediately re-pressurize the line to the original test pressure and continue test, and record amount of water required to re-pressurize the line.

7. At the end of the test, re-pressurize the line to the original test pressure, and record amount of water required to re-pressurize the line.

8. Add total amount of water required to re-pressurize the line during and at the end of the test and compare with the allowable make-up water as calculated below.

9. If the pressure test is not completed due to leakage, equipment failure, etc., the test section should be de-pressurized, and allowed to "relax" for at least eight (8) hours before bringing the test section up to test pressure again.

F. Allowable Make-up Water U.S. Gallons per 100 feet of pipe shall be as shown on the following table:

Nominal Pipe Size	1 Hour Test	2 Hour Test	3 Hour Test
12-Inch	1.1	2.3	3.4
20-Inch	2.8	5.5	8.0

G. Repair, at no cost to Owner, any section of the pipe that fails this test.

H. Repair any visible leakage, regardless of the results of the leakage test.

I. Retest all repaired sections of line, at no cost to Owner, until pressure test is successfully completed.

3.07 TESTING OF CONTROL WIRE

A. Test control wire for proper functioning using a conductive/inductive type locator in the presence of the Owner.

B. Repair and retest, at no extra cost to the Owner, any section of tracing wire that does not function properly.

3.08 FLUSHING WATER MAINS

A. Flush prior to disinfection, unless otherwise explicitly approved by the Owner.

B. Flush treatment plant to East Glacier Water main with potable water.

C. Flush the intake to treatment plant water transmission main with water.

D. Flush to provide 3 volumetric exchanges in the pipeline at a minimum velocity of 3-feet per second.

E. If sediment, debris or turbidity (cloudiness) is visually apparent in the discharge, "poly-pig" the main or repeat flushing until clear.

3.09 DISINFECTION OF WATER MAIN AND FITTINGS

A. Disinfection will only be required for the water main from the Treatment Plant to East Glacier.

B. Disinfect in accordance with one of the methods outlined in Section 5 of AWWA C651.

1. Continuous Feed Method:
   a. Continuously introduce a solution with 25-mg/L free chlorine concentration from one end of the section being disinfected.
   b. Leave solution in contact with system for 24-hours.
   c. At the end of 24-hours, must have at least a 10-mg/L chlorine residual.

2. Slug Method:
   a. Slowly feed water dosed with chlorine to a concentration of 100-mg/L free residual chlorine from one end of the section being disinfected.
   b. Ensure that the concentration of fed chlorine remains at 100 mg/L.
   c. Ensure that all parts of the main and appurtenances are exposed to the 100-mg/L concentration for at least 3-hours.

C. Ensure that the chlorine solution is introduced within 10-feet of the end of the section being disinfected and for all cases, is being withdrawn or wasted from the most extreme point relative to the point of water introduction. If branches exist, ensure that the chlorinated solution reaches all portions of the branches.

D. Waste flushed disinfection water in an environmentally safe manner. In no case shall direct disposal to a surface water be permitted.

1. Check the chlorine residual at time of disposal.

2. If disposal to a community sewer system is available, neutralize the chlorine residual if the free residual is above 10 mg/l.

3. If disposal is to the ground surface or ditch, neutralize the chlorine residual if the free residual is above 1 mg/L.

4. Use the following neutralization chemical schedule:

   a. Sulfur Dioxide at 0.8 lb / 100,000 gallons / mg/L of free chlorine.

b. Sodium Bisulfite at 1.2 lb / 100,000 gallons / mg/L of free chlorine.
c. Sodium Sulfite at 1.4 lb / 100,000 gallons / mg/L of free chlorine.
d. Sodium Thiosulfate at 1.2 lb / 100,000 gallons / mg/L of free chlorine.

5. Continue flushing until the chlorine residual reaches distribution system levels.

E. After disinfecting and flushing but before the water main is placed in service, collect and test water samples for bacteriological quality.

1. Sample in accordance with the Standard Methods for Examination of Water and Wastewater.

2. Take two consecutive batches of tests, 24 hours apart.

3. Collect one sample from each flush hydrant along the pipeline.

4. Deliver samples to a state certified testing lab and provide Project Engineer with results within 24 hours of laboratory results.

F. If initial disinfection fails to produce satisfactory bacteriological results, rechlorinate the mains and branch lines, flush and take new samples until satisfactory results are obtained.

G. Do not place main in service until the Project Engineer has received safe bacteriological results.

3.10 CONNECTIONS TO EXISTING DISTRIBUTION SYSTEMS

A. Shutoff of mains will not be permitted overnight, over weekends, or on federal holidays.

B. Coordinate system tie-in with the Owner and/or operator of the existing utility a minimum of three working days before any connection is made.

C. Notify residents affected by the water shutoff of the time and day of shutoff a minimum of two working days in advance.

D. Only start work when all the materials, equipment and labor are on site.

E. Clean all connection components with a chlorine solution prior to installation.

F. Once work on the connection has commenced, it shall proceed continuously without interruption, and as rapidly as possible until completed.

G. Visually inspect any joints not pressure tested for leakage.

1. Test under system pressure prior to backfilling
2. Test in the presence of the Owner representative.
3. Repair and retest any joint with leakage until no leakage is visible.

PART 4 – MEASUREMENT AND PAYMENT, NOT USED

END SECTION 02510

SECTION 02718
WATER VALVES AND HYDRANTS

PART 1 – GENERAL

1.01 SUMMARY

A. This section includes furnishing and installing valves and hydrants for water mains, together with related appurtenances.

1.02 RELETED WORK

A. SECTION 02510 – HDPE Water Transmission Main

B. SECTION 02315 – Excavation, Trenching and Bedding for Pipelines

C. SECTION 03300 – Cast-in-place Concrete

1.03 REFERENCES

A. ANSI/AWWA C509 – Resilient Seat Gate Valves for Water and Sewerage Systems.

B. ANSI/AWWA C-105 – Polyethylene Encasement for Gran and Ductile Iron Pipe and Fittings for Water and Other Liquids

C. ANSI/AWWA C104 – Cement-Mortar Lining for Ductile Iron Pipe and Fittings for Water

D. ANSI/AWWA C110/A21.10 – Ductile Iron and Gray Iron Fittings, 3-inch Through 48-inch, for Water and Other Liquids

E. ANSI/AWWA - C111/A21.11 – Rubber-Gasket Joints for Ductile Iron and Gray Iron Pressure Pipe and Fittings.

F. ANSI/AWWA - C153/A21.53 – Ductile Iron Compact Fittings, 3-inch Through 16-inch, for Water and Other Liquids.

G. ANSI/AWWA C515 – Reduced Wall, Resilient Seated Gate Valve for Water Supply Service

1.04 SUBMITTALS

A. Gate Valves

B. Valve Boxes

C. Butterfly Valves

D. Combination Air Release/Air Vacuum Valves

E. Air Release Valve Pit and Appurtences

F. Corporation Stops

G. Curb Stops and Box

H. Flush Hydrants

1.05 DEFINITIONS

A. Fully Restrained: A fully restrained joint is one in which the pipe yields before the joint disjoins.

1.06 QUALITY ASSURANCE

A. All valving materials on the job must be from one manufacturer, unless the Project Engineer approves an exception in writing.

B. Do not lay pipe when trenches or weather conditions are not suitable for such work.

1.07 ACCEPTANCE

A. Work covered by this section will not be accepted until the backfilling and testing related with the work has been completed satisfactorily.

PART 2 – PRODUCTS

2.01 GATE VALVES

A. Furnish iron body gate valves, resilient seat or double disc gate valves with non-rising stems with designs, construction and pressure rating meeting AWWA C500 or AWWA C509 requirements and the following.

B. Assure stem seals are double "O" ring seals capable of replacing the seal above the stem collar with the valve under pressure in full open position.

C. Furnish gate valves for underground installation equipped with a 2-inch square operating nut for key operation. All valves to open counterclockwise. Valves to be equipped with flanged joints for pipe connections.

D. Furnish performance certification, leakage and hydrostatic tests as specified in AWWA C504. Assure valve manufacturer has at least five years experience manufacturing waterworks and distribution valves. Furnish gate valves by Mueller, Kennedy, or an approved equal.

2.02 BUTTERFLY VALVES

A. Furnish Class 150, rubber seated, butterfly valves for water distribution systems meeting AWWA C504 requirements. Valves to be equipped with flanged joint ends and lubricated screw type operators designed for underground service.

B. Rubber valve seats to be replaceable without disassembling the valve and not interrupted by the shafting. Rubber seats may be retained on the disc edge by stainless steel clamping instead of bonding to the valve body. Assure shaft packing is the self-adjusting, permanent type.

C. Assure underground service operators are permanently lubricated, screw type, totally enclosed and watertight constructed. Assure overload protection is incorporated in the operator allowing 450 foot-pounds input torque at full-open and full-closed positions without damaging the operator or valve. Provide a 2-inch square operating nut and valve box for operating valve. Valves to open counter clockwise.

D. Furnish performance certification, leakage and hydrostatic tests as specified in AWWA C504. Assure valve manufacturer has at least five years experience manufacturing waterworks and distribution valves. Furnish butterfly valves by Mueller, Kennedy, or an approved equal.

2.03 POLYETHYLENE ENCASEMENT

A. Polyethylene encasement shall conform to the requirements of AWWA C-105. Flat sheets shall be furnished for wrapping all buried ductile iron pipe, valves and fittings buried.

2.04 VALVE BOXES

A. Furnish cast iron valve boxes, 5-1/4-inch diameter, adjustable valve boxes with the required base for the valve size used. Assure valve boxes are screw type and of the specified length for the pipe bury. Assure the valve box cast iron cover has an arrow indicating the opening direction and stamped with the word “Water”. Valve boxes to be Tyler or approved equal.

2.05 COMBINATION AIR-RELEASE/VACUUM VALVE (For 12-Inch main)

A. Construction: Cast iron with stainless steel trim.

B. Operation: Float operated.

C. Acceptable Products: Apco Combination Air Valve Model 143C or Valmatic Model 201C.

D. ARV Service Line:
   1. Corporation Saddle: Equal to Poly-Cam, Series 710, 1-inch HDPE pipe SDR9 Transition Fitting with Male NPT, Thermally fused to watermain
   2. Corporation Stop: Equal to Mueller B-25009 or Ford FB1001-4
   3. .
   4. Service Line: SDR 9 IPS Polyethylene
   5. Joints: Compression-type.
   6. Curb Stop: 1-inch ball valve curb stop equal to Mueller H-15211 or Ford B55-444.
   7. Curb Box: Mueller H-10302 or Ford EM2-60-67.

E. ARV Box: Rigid PVC with insulation for extreme cold weather, equal to Mueller Air Valve Pit as indicated in the plans.

2.06 COMBINATION AIR-RELEASE/VACUUM VALVE (20-Inch main)

A. Construction: Cast iron with stainless steel trim.

B. Operation: Float operated.

C. Acceptable Products: Apco Combination Air Valve Model 147C or Valmatic 203C.

D. ARV Connection:

1. Corporation Saddle: Equal to Poly-Cam, Series 710, 3-inch HDPE pipe SDR9 Transition Fitting with Male NPT, Thermally fused to watermain.
2. Ball Valve: 3-inch, carbon steel, threaded ball valve equal to Apollo Model 89-100.

E. ARV Manhole. The ARV Manhole shall be constructed of 5-inch thick reinforced precast concrete walls with an inside diameter of 48 inches conforming to ASTM C478 latest revision and a 8-inch thick reinforce concrete base slab.

1. Vault Steps: Equal to Deeter 1601 or Neenah R-1980-I.
2. Access Frame and Cover: The access frame and cover shall be a frost proof cover and the combined weight shall not be less than 700 pounds.
3. Joint Sealant: The sections of the manhole shall be sealed with a flexible butyl rubber joint sealant.
4. Floor Drain: A cast iron floor drain equal to a Deeter 1976 or Neenah R-2525-D.
5. Gravel base: The gravel base shall be a pea gravel placed 15 inches below the concrete slab.
6. Pipe Entrances: Link Seal Model "C" or equal shall be installed at the pipe entrances.

F. FLUSH HYDRANTS: The Flush Hydrants piping shall be constructed of cast iron pipe with a bituminous coating. The gate valve shall be in accordance with Section 02718.

PART 3 – EXECUTION

3.01 VALVES

A. Set and joint gate valves and butterfly valves to the pipe as specified for pipe laying and jointing. Set valves with operating nut vertical. Center and plumb valve boxes over the operating nut to prevent shock or stress being transmitted to the valve.

3.02 VALVE BOXES

A. Center and plumb valve boxes over the valve operating nut. Set valve box tops flush with the ground surface or street surfacing.

B. Place bedding gravel around all water main valves and under the valve box bottom to drain any water entering the valve box.

3.03 RESTRAINT

A. Concrete thrust blocks shall be used as the method of restraint per the details on the plans.

3.04 POLYETHYLENE ENCASEMENT

A. Wrap all direct bury cast iron or ductile iron pipe and fittings including hydrants, valve boxes, curb boxes, and all other metal parts and surfaces, in polyethylene encasement.

3.05 COMBINATION ARV INSTALLATION

A. Install at the locations shown on the plans and per the detail drawings.

B. Do not couple dissimilar metals that could lead to galvanic action.

C. Install corporation stop tap at top of pipeline (12 o'clock position)

D. Install service line at a constant upward gradient to the ARV.

E. Gravel shall be placed as shown on the details.

3.06 FLUSH HYDRANT ASSEMBLIES

A. Install at the locations shown on the plans and per the detail drawings.

B. Use fittings and valves per details and with fittings that meet this specification.

C. Fully restrain mechanical joints.

D. Set valve and bottom of the barrel on precast concrete blocks and pour thrust blocks.

E. Place pea gravel near the bottom of the hydrant barrel and drill a 1/8" weep hole near the bottom of the barrel.

F. Paint the above ground barrel with white paint.

PART 4 – MEASUREMENT AND PAYMENT, NOT USED

END SECTION 02718

SECTION 02910
SEEDING AND FERTILIZING

PART 1 – GENERAL

1.01 SUMMARY

A. The work described in this section shall consist of providing all labor, services, fertilizer, seed and equipment to seed, fertilize and establish grasses as per these specifications.

B. All areas disturbed prior to and during trenching and construction operations (excluding the lake bed below high water level) shall be topsoiled and seeded to native grass. The Contractor shall be responsible for estimating prior to bidding the amount of area to be seeded.

1.02 RELATED WORK

A. SECTION 02310 - Grading

1.03 SUBMITTALS

A. Seed Mix

B. Fertilizer

PART 2 – PRODUCTS

2.01 NATIVE GRASS SEED

A. Grass seed will be provided by the Contractor. All seed shall be properly stored by the Contractor and any seed damaged during such storage shall be replaced by the Contractor.

B. The seed shall be a mixture of the species and variety specified and shall be applied at the pure live seed (not gross amount) rate of 15 lbs/acre for dryland or native grass. The seed shall be furnished in labeled bags and the tags shall be delivered to the Owner.

C. The Contractor shall submit samples and certifications of each type of seed to the Owner for approval. The mixture shall have the follow percentages of each type of grass listed.

Species or Variety	Percentage by Weight in Mixture Native Grass
Western Wheatgrass	33%
Blue Bunch Wheatgrass	34%
Rough Fescue	33%

D. Seed shall comply with and be labeled in accordance with the Montana Seed Law. Seed shall have been grown in the North American Continent above 41 degrees latitude. All seed shall be standard grade adapted to Montana conditions.

2.02 FERTILIZER

A. Fertilizer shall be furnished by the Contractor and shall be applied at the rates specified below:

Dryland Grass

50 lbs. Nitrogen/Acre
50 lbs. Phosphate/Acre

B. The commercial fertilizer shall be delivered in standard size bags of the manufacturer showing weight analysis and manufacturer's name.

C. The Owner reserves the right to test the material at any time and to accept or reject the material based on these tests.

D. If the fertilizer is not used immediately, the Contractor shall store the unused material in a place designated by the Owner's representative and in such a manner that its usefulness will not be impaired.

2.03 TOPSOIL

A. Topsoil shall be considered the top 12 inches of soil stripped from the site provided it is free of refuse and reasonably free of stumps, roots, brush, stones (1.5 inches or more in diameter), clay lumps, or similar objects. Brush and other vegetation which will not be incorporated with the soil during handling operations shall be cut and removed. Ordinary herbaceous growth such as grass and weeds do not need to be removed but shall be thoroughly broken up and intermixed with the soil during handling operations.

PART 3 - EXECUTION

3.01 TIME OF SEEDING

A. Seeding shall be planted after the top soiling and grading is completed. The planting will take place after the installation of all other items in this contract. Native grass seed shall be planted prior to June 1 or after September 15. Seeding shall be done in dry or moderately dry soil.

3.02 PREPERATION

A. After the finish grading, topsoil has been placed and compacted, and just before seeding, all cut and fill slopes and flatter surfaces shall be loosened and raked to true lines, free from all unsightly variations, humps, ridges and depressions.

3.03 INSTALLATION

A. NATIVE OR DRYLAND SEEDING

1. Native or dryland seeding shall be done using a grass drill. Hand application and raking may be used in confined areas not accessible to the drilling operation.

B. APPLICATION RATE

1. Seed shall be applied at the following rates of pure live seed per acre:

	Application Rate Pounds Live Seed per Acre
Western Wheatgrass	2.0
Blue Bunch Wheatgrass	2.3
Rough Fescue	1.6

3.05 FIELD QUALITY CONTROL

A. The Contractor shall be responsible for the proper care and maintenance of the seeded areas during the period when the grass is becoming established.

B. The Owner shall assume responsibility for the maintenance of areas when the grass has reached a uniform height of four inches over an entire area or completion of the project, whichever is later. The Owner may accept definable areas for maintenance and may require the Contractor to maintain areas which are not acceptable at that time. Areas that require reseeding will be designated by the Project Engineer. Reseeding shall be completed within the specified dates permitted for seeding or in such period as may be allowed by the Project Engineer. Reseeding shall be with the same seed types, mixture and method as originally used and shall be applied at the rate specified for the original seeding in a manner that will cause a minimum of disturbance of the existing stand of grass. Reseeding shall be accomplished at no additional cost to the Owner. Seed, equipment and labor for reseeding will be supplied by the Contractor.

C. If at any time before completion and acceptance of the entire work covered by this contract, any portion of the surface becomes gullied or otherwise damaged following seeding the affected portion shall be repaired to re-establish the condition and grade of the soil prior to seeding and shall then be reseeded as specified above.

PART 4 – MEASUREMENT AND PAYMENT, NOT USED

END SECTION 02910

SECTION 033000
CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings apply to this Section.

1.02 SUMMARY

A. This Section specifies cast-in place concrete, including formwork, reinforcing, mix design, placement procedures, and finishes.

B. Cast-in-place concrete includes the following:

1. Grade beams
2. Structural slabs.
3. Continuous Footings

1.03 SUBMITTALS

A. General: Submit the following.

B. Shop drawings for reinforcement detailing fabricating, bending, and placing concrete reinforcement. Comply with ACI 315 "Manual of Standard Practice for Detailing Reinforced Concrete Structures" showing bar schedules, stirrup spacing, bent bar diagrams, and arrangement of concrete reinforcement. Include special reinforcing required for openings through concrete structures.

1.04 QUALITY ASSURANCE

A. Codes and Standards: Comply with provisions of the following codes, specifications, and standards, except where more stringent requirements are shown or specified:

1. American Concrete Institute (ACI) 301, "Specifications for Structural Concrete for Buildings."
2. ACI 318, "Building Code Requirements for Reinforced Concrete."
3. Concrete Reinforcing Steel Institute (CRSI) "Manual of Standard Practice."

B. Concrete Testing Service: Engage a testing agency acceptable to Project Engineer to perform material evaluation tests and to design concrete mixes.

C. Materials and installed work may require testing and retesting at any time during progress of Work. Tests, including retesting of rejected materials for installed Work, shall be done at Contractor's expense.

PART 2 - PRODUCTS

2.01 FORM MATERIALS

A. Forms for Exposed Finish Concrete: Plywood, metal, metal-framed plywood faced, or other acceptable panel-type materials to provide continuous, straight, smooth, exposed surfaces. Furnish in largest practicable sizes to minimize number of joints and to conform to joint system shown on drawings.

B. Form Release Agent: Provide commercial formulation form release agent with a maximum of 350 g/L volatile organic compounds (VOCs) that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

C. Form Ties: Factory-fabricated, adjustable-length, removable or snap-off metal form ties designed to prevent form deflection and to prevent spalling of concrete upon removal. Provide units that will leave no metal closer than 1-1/2 inches to the plane of the exposed concrete surface.

1. Provide ties that, when removed, will leave holes not larger than 1 inch in diameter in the concrete surface.

2.02 REINFORCING MATERIALS

A. Reinforcing Bars: ASTM A 615 Grade 60 (ASTM A 615M Grade 400), deformed.

B. Supports for Reinforcement: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place. Use wire bar-type supports complying with CRSI specifications.

1. For slabs-on-grade, use supports with sand plates or horizontal runners where base material will not support chair legs.
2. For exposed-to-view concrete surfaces where legs of supports are in contact with forms, provide supports with legs that are protected by plastic (CRSI, Class 1) or stainless steel (CRSI, Class 2).

2.03 CONCRETE MATERIALS

A. Portland Cement: ASTM C 150, Type I-II.

1. Use one brand of cement throughout Project unless otherwise acceptable to Project Engineer.

B. Fly Ash: ASTM C 618, Type F.

C. Normal-Weight Aggregates: ASTM C 33 and as specified. Provide aggregates from a single source for exposed concrete.

1. Local aggregates not complying with ASTM C 33 that have been shown to produce concrete of adequate strength and durability by special tests or actual service may be used when acceptable to Project Engineer.

D. Water: Potable.

E. Admixtures, General: Provide concrete admixtures that contain not more than 0.1 percent chloride ions.

F. Air-Entraining Admixture: ASTM C 260, certified by manufacturer to be compatible with other required admixtures.

1. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:
   a. Air-Tite, Cormix Construction Chemicals.
   b. Air-Mix or Perma-Air, Euclid Chemical Co.
   c. Darex AEA or Daravair, W.R. Grace & Co.
   d. MB-VR or Micro-Air, Master Builders, Inc.
   e. Sealtight AEA, W.R. Meadows, Inc.
   f. Sika AER, Sika Corp.

G. Water-Reducing Admixture: ASTM C 494, Type A.

1. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:
   a. Chemtard, ChemMasters Corp.
   b. PSI N, Cormix Construction Chemicals.
   c. Eucon WR-75, Euclid Chemical Co.
   d. WRDA, W.R. Grace & Co.
   e. Pozzolith Normal or Polyheed, Master Builders, Inc.
   f. Metco W.R., Metalcrete Industries.
   g. Prokrete-N, Prokrete Industries.

H. High-Range Water-Reducing Admixture: ASTM C 494, Type F or Type G.

1. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:
   a. Super P, Anti-Hydro Co., Inc.
   b. Cormix 200, Cormix Construction Chemicals.
   c. Eucon 37, Euclid Chemical Co.
   d. WRDA 19 or Daracem, W.R. Grace & Co.
   e. Rheobuild or Polyheed, Master Builders, Inc.
   f. Superslump, Metalcrete Industries.
   g. PSPL, Prokrete Industries.

I. Water-Reducing, Accelerating Admixture: ASTM C 494, Type E.

1. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:
   a. Q-Set, Conspec Marketing & Manufacturing Co.
   b. Lubricon NCA, Cormix Construction Chemicals.
   c. Accelguard 80, Euclid Chemical Co.
   d. Daraset, W.R. Grace & Co.
   e. Pozzutec 20, Master Builders, Inc.
   f. Accel-Set, Metalcrete Industries.

J. Water-Reducing, Retarding Admixture: ASTM C 494, Type D.

1. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:
   a. PSI-R Plus, Cormix Construction Chemicals.
   b. Eucon Retarder 75, Euclid Chemical Co.
   c. Daratard-17, W.R. Grace & Co.
   d. Pozzolith R, Master Builders, Inc.
   e. Protard, Prokrete Industries.
   f. Plastiment, Sika Corporation.

2.04 RELATED MATERIALS

A. Vapor Retarder: Provide vapor retarder that is resistant to deterioration when tested according to ASTM E 154, as follows:

1. Polyethylene sheet not less than 8 mils thick.
2. Water-resistant barrier consisting of heavy kraft papers laminated together with glass-fiber reinforcement and overcoated with black polyethylene on each side.

   a. Product: Subject to compliance with requirements, provide Moistop by Fortifiber Corporation.

B. Absorptive Cover: Burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd., complying with AASHTO M 182, Class 2.

C. Moisture-Retaining Cover: One of the following, complying with ASTM C 171.

1. Waterproof paper.
2. Polyethylene film.
3. Polyethylene-coated burlap.

D. Liquid Membrane-Forming Curing Compound: Liquid-type membrane-forming curing compound complying with ASTM C 309, Type I, Class A. Moisture loss not more than 0.55 kg/sq. m when applied at 200 sq. ft./gal.

1. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:
   a. A-H 3 Way Sealer, Anti-Hydro Co., Inc.
   b. Spartan-Cote, The Burke Co.
   c. Conspec #1, Conspec Marketing & Mfg. Co.
   d. Sealco 309, Cormix Construction Chemicals.
   e. Day-Chem Cure and Seal, Dayton Superior Corp.
   f. Eucocure, Euclid Chemical Co.
   g. Horn Clear Seal, A.C. Horn, Inc.
   h. L&M Cure R, L&M Construction Chemicals, Inc.
   i. Masterkure, Master Builders, Inc.
   j. CS-309, W.R. Meadows, Inc.
   k. Seal N Kure, Metalcrete Industries.
   l. Kure-N-Seal, Sonneborn-Chemrex.

m. Stontop CS2, Stonhard, Inc.

E. Water-Based Acrylic Membrane Curing Compound: ASTM C 309, Type I, Class B.

1. Provide material that has a maximum volatile organic compound (VOC) rating of 350 g/L.
2. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:
   a. Highseal, Conspec Marketing and Mfg. Co.
   b. Sealco - VOC, Cormix Construction Chemicals.
   c. Safe Cure and Seal, Dayton Superior Corp.
   d. Aqua-Cure, Euclid Chemical Co.
   e. Dress & Seal WB, L&M Construction Chemicals, Inc.
   f. Masterkure 100W, Master Builders, Inc.
   g. Vocomp-20, W.R. Meadows, Inc.
   h. Metcure, Metalcrete Industries.
   i. Stontop CS1, Stonhard, Inc.

F. Evaporation Control: Monomolecular film-forming compound applied to exposed concrete slab surfaces for temporary protection from rapid moisture loss.

1. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:
   a. Aquafilm, Conspec Marketing and Mfg. Co.
   b. Eucobar, Euclid Chemical Co.
   c. E-Con, L&M Construction Chemicals, Inc.
   d. Confilm, Master Builders, Inc.
   e. Waterhold, Metalcrete Industries.

G. Bonding Agent: Polyvinyl acetate or acrylic base.

1. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:
   a. Polyvinyl Acetate (Interior Only):

      1) Superior Concrete Bonder, Dayton Superior Corp.
      2) Euco Weld, Euclid Chemical Co.
      3) Weld-Crete, Larsen Products Corp.
      4) Everweld, L&M Construction Chemicals, Inc.
      5) Herculox, Metalcrete Industries.
      6) Ready Bond, Symons Corp.

   b. Acrylic or Styrene Butadiene:

      1) Acrylic Bondcrete, The Burke Co.
      2) Strongbond, Conspec Marketing and Mfg. Co.
      3) Day-Chem Ad Bond, Dayton Superior Corp.
      4) SBR Latex, Euclid Chemical Co.
      5) Daraweld C, W.R. Grace & Co.
      6) Hornweld, A.C. Horn, Inc.
      7) Everbond, L&M Construction Chemicals, Inc.

8) Acryl-Set, Master Builders Inc.
9) Intralok, W.R. Meadows, Inc.
10) Acrylpave, Metalcrete Industries.
11) Sonocrete, Sonneborn-Chemrex.
12) Stonlock LB2, Stonhard, Inc.
13) Strong Bond, Symons Corp.

2.05 PROPORTIONING AND DESIGNING MIXES

A. Prepare design mixes for each type and strength of concrete by either laboratory trial batch or field experience methods as specified in ACI 301. For the trial batch method, use an independent testing agency acceptable to Project Engineer for preparing and reporting proposed mix designs.

1. Do not use the same testing agency for field quality control testing.
2. Limit use of fly ash to not exceed 25 percent of cement content by weight for each class of concrete at least 15 days prior to start of Work. Do not begin concrete production until proposed mix designs have been reviewed by Project Engineer.

B. Design mixes to provide normal weight concrete with the following properties as indicated on drawings and schedules:

1. 4000 psi, 28-day compressive strength; water-cement ratio, 0.35 maximum (air-entrained).

C. Water-Cement Ratio: Provide concrete for following conditions with maximum water-cement (W/C) ratios as follows:

1. Subjected to freezing and thawing: W/C 0.45.

D. Slump Limits: Proportion and design mixes to result in concrete slump at point of placement as follows:

1. Reinforced concrete slabs: Not more than 4 inches.
2. Other concrete: Not more than 4 inches.

E. Adjustment to Concrete Mixes: Mix design adjustments may be requested by Contractor when characteristics of materials, job conditions, weather, test results, or other circumstances warrant, as accepted by Project Engineer. Laboratory test data for revised mix design and strength results must be submitted to and accepted by Project Engineer before using in Work.

2.06 ADMIXTURES

A. Use water-reducing admixture or high-range water-reducing admixture (superplasticizer) in concrete, as required, for placement and workability.

B. Use accelerating admixture in concrete slabs placed at ambient temperatures below 50 ^{O}F.

C. Use air-entraining admixture in exterior exposed concrete unless otherwise indicated. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of

placement having total air content with a tolerance of plus or minus 1-1/2 percent within the following limits:

1. Concrete structures and slabs exposed to freezing and thawing, deicer chemicals, or hydraulic pressure:
   a. 5.0 to 7.0 percent for 3/4 inch maximum aggregate.

D. Use admixtures for water reduction and set accelerating or retarding in strict compliance with manufacturer's directions.

2.07 CONCRETE MIXING

A. Ready-Mixed Concrete: Comply with requirements of ASTM C 94, and as specified.

1. When air temperature is between 85 ^{O}F and 90 ^{O}F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes, and when air temperature is above 90 ^{O}F, reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.01 GENERAL

A. Coordinate the installation of joint materials, vapor retarder/barrier, and other related materials with placement of forms and reinforcing steel.

3.02 FORMS

A. General: Design, erect, support, brace, and maintain formwork to support vertical, lateral, static, and dynamic loads that might be applied until concrete structure can support such loads. Construct formwork so concrete members and structures are of correct size, shape, alignment, elevation, and position. Maintain formwork construction tolerances and surface irregularities complying with the following ACI 347 limits:

1. Provide Class A tolerances for concrete surfaces exposed to view.
2. Provide Class C tolerances for other concrete surfaces.

B. Construct forms to sizes, shapes, lines, and dimensions shown and to obtain accurate alignment, location, grades, level, and plumb work in finished structures. Provide for openings, offsets, sinkages, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulkheads, anchorages and inserts, and other features required in the Work. Use selected materials to obtain required finishes. Solidly butt joints and provide backup at joints to prevent cement paste from leaking.

C. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces where slope is too steep to place concrete with bottom forms only. Kerf wood inserts for forming keyways, reglets, recesses, and the like for easy removal.

D. Provide temporary openings for clean-outs and inspections where interior area of formwork is inaccessible before and during concrete placement. Securely brace temporary openings and

set tightly to forms to prevent losing concrete mortar. Locate temporary openings in forms at inconspicuous locations.

E. Chamfer exposed corners and edges as indicated, using wood, metal, PVC, or rubber chamfer strips fabricated to produce uniform smooth lines and tight edge joints.

F. Provisions for Other Trades: Provide openings in concrete formwork to accommodate work of other trades. Determine size and location of openings, recesses, and chases from trades providing such items. Accurately place and securely support items built into forms.

G. Cleaning and Tightening: Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, or other debris just before placing concrete. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

3.03 PLACING REINFORCEMENT

A. General: Comply with Concrete Reinforcing Steel Institute's recommended practice for "Placing Reinforcing Bars," for details and methods of reinforcement placement and supports and as specified.

1. Avoiding cutting or puncturing vapor retarder/barrier during reinforcement placement and concreting operations. Repair damages before placing concrete.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other materials that reduce or destroy bond with concrete.

C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcing by metal chairs, runners, bolsters, spacers, and hangers, as approved by Project Engineer.

D. Place reinforcement to maintain minimum coverages as indicated for concrete protection. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement operations. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.

3.04 JOINTS

A. Construction Joints: Locate and install construction joints so they do not impair strength or appearance of the structure, as acceptable to Project Engineer.

B. Provide keyways at least 1-1/2 inches deep in construction joints in walls and slabs and between walls and footings. Bulkheads designed and accepted for this purpose may be used for slabs.

C. Place construction joints perpendicular to main reinforcement. Continue reinforcement across construction joints except as indicated otherwise. Do not continue reinforcement through sides of strip placements.

D. Use bonding agent on existing concrete surfaces that will be joined with fresh concrete.

3.05 INSTALLING EMBEDDED ITEMS

A. General: Set and build into formwork anchorage devices and other embedded items required for other work that is attached to or supported by cast-in-place concrete. Use setting drawings, diagrams, instructions, and directions provided by suppliers of items to be attached.

B. Forms for Slabs: Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and contours in finished surfaces. Provide and secure units to support screed strips using strike-off templates or compacting-type screeds.

3.06 PREPARING FORM SURFACES

A. General: Coat contact surfaces of forms with an approved, nonresidual, low-VOC, form-coating compound before placing reinforcement.

B. Do not allow excess form-coating material to accumulate in forms or come into contact with in-place concrete surfaces against which fresh concrete will be placed. Apply according to manufacturer's instructions.

1. Coat steel forms with a nonstaining, rust-preventative material. Rust-stained steel formwork is not acceptable.

3.07 CONCRETE PLACEMENT

A. Inspection: Before placing concrete, inspect and complete formwork installation, reinforcing steel, and items to be embedded or cast in. Notify other trades to permit installation of their work.

B. General: Comply with ACI 304, "Guide for Measuring, Mixing, Transporting, and Placing Concrete," and as specified.

C. Deposit concrete continuously or in layers of such thickness that no new concrete will be placed on concrete that has hardened sufficiently to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as specified. Deposit concrete to avoid segregation at its final location.

D. Placing Concrete in Forms: Deposit concrete in forms in horizontal layers no deeper than 24 inches and in a manner to avoid inclined construction joints. Where placement consists of several layers, place each layer while preceding layer is still plastic to avoid cold joints.

1. Consolidate placed concrete by mechanical vibrating equipment supplemented by hand-spading, rodding, or tamping. Use equipment and procedures for consolidation of concrete complying with ACI 309.

2. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations no farther than the visible effectiveness of the machine. Place vibrators to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to set. At each insertion, limit duration of vibration to time necessary to consolidate

concrete and complete embedment of reinforcement and other embedded items without causing mix to segregate.

E. Placing Concrete Slabs: Deposit and consolidate concrete slabs in a continuous operation, within limits of construction joints, until completing placement of a panel or section.

1. Consolidate concrete during placement operations so that concrete is thoroughly worked around reinforcement, other embedded items and into corners.

2. Bring slab surfaces to correct level with a straightedge and strike off. Use bull floats or darbies to smooth surface free of humps or hollows. Do not disturb slab surfaces prior to beginning finishing operations.

3. Maintain reinforcing in proper position on chairs during concrete placement.

F. Cold-Weather Placement: Comply with provisions of ACI 306 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

G. When air temperature has fallen to or is expected to fall below 40 ^{O}F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 ^{O}F and not more than 80 ^{O}F at point of placement.

1. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.

2. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise accepted in mix designs.

H. Hot-Weather Placement: When hot weather conditions exist that would impair quality and strength of concrete, place concrete complying with ACI 305 and as specified.

1. Cool ingredients before mixing to maintain concrete temperature at time of placement to below 90 ^{O}F. Mixing water may be chilled or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.

2. Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that steel temperature will not exceed the ambient air temperature immediately before embedding in concrete.

3. Fog spray forms, reinforcing steel, and subgrade just before placing concrete. Keep subgrade moisture uniform without puddles or dry areas.

4. Use water-reducing retarding admixture when required by high temperatures, low humidity, or other adverse placing conditions, as acceptable to Architect.

3.08 FINISHING FORMED SURFACES

A. Rough-Formed Finish: Provide a rough-formed finish on formed concrete surfaces not exposed to view in the finished Work or concealed by other construction. This is the concrete

surface having texture imparted by form-facing material used, with tie holes and defective areas repaired and patched, and fins and other projections exceeding 1/4 inch (6 mm) in height rubbed down or chipped off.

B. Smooth-Formed Finish: Provide a smooth-formed finish on formed concrete surfaces exposed to view or to be covered with a coating material applied directly to concrete, or a covering material applied directly to concrete, such as waterproofing, dampproofing, veneer plaster, painting, or another similar system. This is an as-cast concrete surface obtained with selected form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch defective areas with fins and other projections completely removed and smoothed.

C. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike-off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.09 MONOLITHIC SLAB FINISHES

A. Float Finish: Apply float finish to monolithic slab surfaces to receive trowel finish and other finishes as specified; slab surfaces to be covered with membrane or elastic waterproofing, membrane or elastic roofing, or sand-bed terrazzo; and where indicated.

1. After screeding, consolidating, and leveling concrete slabs, do not work surface until ready for floating. Begin floating, using float blades or float shoes only, when surface water has disappeared, or when concrete has stiffened sufficiently to permit operation of power-driven floats, or both. Consolidate surface with power-driven floats or by hand-floating if area is small or inaccessible to power units. Finish surfaces to tolerances of F(F) 18 (floor flatness) and F(L) 15 (floor levelness) measured according to ASTM E 1155 (ASTM E 1155M). Cut down high spots and fill low spots. Uniformly slope surfaces to drains. Immediately after leveling, refloat surface to a uniform, smooth, granular texture.

B. Trowel Finish: Apply a trowel finish to monolithic slab surfaces exposed to view and slab surfaces to be covered with resilient flooring, carpet, ceramic or quarry tile, paint, or another thin film-finish coating system.

1. After floating, begin first trowel-finish operation using a power-driven trowel. Begin final troweling when surface produces a ringing sound as trowel is moved over surface. Consolidate concrete surface by final hand-troweling operation, free of trowel marks, uniform in texture and appearance, and finish surfaces to tolerances of F(F) 20 (floor flatness) and F(L) 17 (floor levelness) measured according to ASTM E 1155 (ASTM E 1155M). Grind smooth any surface defects that would telegraph through applied floor covering system.

C. Nonslip Broom Finish: Apply a nonslip broom finish to exterior concrete platforms, steps, and ramps, and elsewhere as indicated.

1. Immediately after float finishing, slightly roughen concrete surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

3.10 MISCELLANEOUS CONCRETE ITEMS

A. Filling In: Fill in holes and openings left in concrete structures for passage of work by other trades, unless otherwise shown or directed, after work of other trades is in place. Mix, place, and cure concrete as specified to blend with in-place construction. Provide other miscellaneous concrete filling shown or required to complete Work.

3.11 CONCRETE CURING AND PROTECTION

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. In hot, dry, and windy weather protect concrete from rapid moisture loss before and during finishing operations with an evaporation-control material. Apply according to manufacturer's instructions after screeding and bull floating, but before power floating and troweling.

B. Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing. Weather permitting, keep continuously moist for not less than 7 days.

C. Curing Methods: Cure concrete by curing compound, by moist curing, by moisture-retaining cover curing, or by combining these methods, as specified.

D. Provide moisture curing by the following methods:

1. Keep concrete surface continuously wet by covering with water.

2. Use continuous water-fog spray.

3. Cover concrete surface with specified absorptive cover, thoroughly saturate cover with water, and keep continuously wet. Place absorptive cover to provide coverage of concrete surfaces and edges, with a 4-inch lap over adjacent absorptive covers.

E. Provide moisture-retaining cover curing as follows:

1. Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width with sides and ends lapped at least 3 inches and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

F. Apply curing compound on exposed interior slabs and on exterior slabs, walks, and curbs as follows:

1. Apply curing compound to concrete slabs as soon as final finishing operations are complete (within 2 hours and after surface water sheen has disappeared). Apply uniformly in continuous operation by power spray or roller according to manufacturer's directions. Recoat areas subjected to heavy rainfall within 3 hours after initial application. Maintain continuity of coating and repair damage during curing period.

2. Use membrane curing compounds that will not affect surfaces to be covered with finish materials applied directly to concrete.

G. Curing Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces, by moist curing with forms in place for the full curing period or until forms are removed. If forms are removed, continue curing by methods specified above, as applicable.

H. Curing Unformed Surfaces: Cure unformed surfaces, including slabs, floor topping, and other flat surfaces, by applying the appropriate curing method.

1. Final cure concrete surfaces to receive finish flooring with a moisture-retaining cover, unless otherwise directed.

3.12 REMOVING FORMS

A. General: Formwork not supporting weight of concrete, such as sides of beams, walls, columns, and similar parts of the work, may be removed after cumulatively curing at not less than 50 ^{O}F for 24 hours after placing concrete, provided concrete is sufficiently hard to not be damaged by form-removal operations, and provided curing and protection operations are maintained.

B. Formwork supporting weight of concrete, such as beam soffits, joists, slabs, and other structural elements, may not be removed in less than 14 days or until concrete has attained at least 75 percent of design minimum compressive strength at 28 days. Determine potential compressive strength of in-place concrete by testing field-cured specimens representative of concrete location or members.

C. Form-facing material may be removed 4 days after placement only if shores and other vertical supports have been arranged to permit removal of form-facing material without loosening or disturbing shores and supports.

3.13 REUSING FORMS

A. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-coating compound as specified for new formwork.

B. When forms are extended for successive concrete placement, thoroughly clean surfaces, remove fins and laitance, and tighten forms to close joints. Align and secure joint to avoid offsets. Do not use patched forms for exposed concrete surfaces except as acceptable to Project Engineer.

3.14 CONCRETE SURFACE REPAIRS

A. Patching Defective Areas: Repair and patch defective areas with cement mortar immediately after removing forms, when acceptable to Architect.

B. Mix dry-pack mortar, consisting of one part portland cement to 2-1/2 parts fine aggregate passing a No. 16 mesh sieve, using only enough water as required for handling and placing.

1. Cut out honeycombs, rock pockets, voids over 1/4 inch in any dimension, and holes left by tie rods and bolts down to solid concrete but in no case to a depth less than 1-inch. Make edges of cuts perpendicular to the concrete surface. Thoroughly clean, dampen

with water, and brush-coat the area to be patched with bonding agent. Place patching mortar before bonding agent has dried.

2. For surfaces exposed to view, blend white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Provide test areas at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike-off slightly higher than surrounding surface.

C. Repairing Formed Surfaces: Remove and replace concrete having defective surfaces if defects cannot be repaired to satisfaction of Architect. Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycomb, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning. Flush out form tie holes and fill with dry-pack mortar or precast cement cone plugs secured in place with bonding agent.

1. Repair concealed formed surfaces, where possible, containing defects that affect the concrete's durability. If defects cannot be repaired, remove and replace the concrete.

D. Repairing Unformed Surfaces: Test unformed surfaces, such as monolithic slabs, for smoothness and verify surface tolerances specified for each surface and finish. Correct low and high areas as specified. Test unformed surfaces sloped to drain for trueness of slope and smoothness by using a template having the required slope.

1. Repair finished unformed surfaces containing defects that affect the concrete's durability. Surface defects include crazing and cracks in excess of 0.01 inch wide or that penetrate to the reinforcement or completely through nonreinforced sections regardless of width, spalling, popouts, honeycombs, rock pockets, and other objectionable conditions.

2. Correct high areas in unformed surfaces by grinding after concrete has cured at least 14 days.

3. Correct low areas in unformed surfaces during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete. Proprietary underlayment compounds may be used when acceptable to Architect.

4. Repair defective areas, except random cracks and single holes not exceeding 1-inch in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose reinforcing steel with at least 3/4 inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials to provide concrete of same type or class as original concrete. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.

E. Repair isolated random cracks and single holes 1 inch or less in diameter by dry-pack method. Groove top of cracks and cut out holes to sound concrete and clean of dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding compound. Place dry-pack before bonding agent has dried. Compact dry-pack mixture in place and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

F. Perform structural repairs with prior approval of Architect for method and procedure, using specified epoxy adhesive and mortar.

G. Repair methods not specified above may be used, subject to acceptance of Architect.

3.15 QUALITY CONTROL TESTING DURING CONSTRUCTION

A. General: The Contractor will employ a testing agency to perform tests and to submit test reports.

B. Sampling and testing for quality control during concrete placement will include the following.

1. Sampling Fresh Concrete: ASTM C 172, except modified for slump to comply with ASTM C 94.

a. Slump: ASTM C 143; one test at point of discharge for each load of each type of concrete: additional tests when concrete consistency seems to have changed.

b. Air Content: ASTM C 173, volumetric method for lightweight or normal weight concrete; ASTM C 231, pressure method for normal weight concrete; one for each day's pour of each type of air-entrained concrete.

c. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 ^{O}F and below, when 80 ^{O}F and above, and one test for each set of compressive-strength specimens.

d. Compression Test Specimen: ASTM C 31; one set of four standard cylinders for each compressive-strength test, unless otherwise directed. Mold and store cylinders for laboratory-cured test specimens except when field-cured test specimens are required.

e. Compressive-Strength Tests: ASTM C 39; one set for each day's pour exceeding 5 cu. yd. plus additional sets for each 25 cu. yd. more than the first 10 cu. yd of each concrete class placed in any one day; one specimen tested at 7 days, two specimens tested at 28 days, and one specimen retained in reserve for later testing if required.

2. When frequency of testing will provide fewer than five strength tests for a given class of concrete, conduct testing from at least five randomly selected batches or from each batch if fewer than five are used.

3. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, evaluate current operations and provide corrective procedures for protecting and curing the in-place concrete.

4. Strength level of concrete will be considered satisfactory if averages of sets of three consecutive strength test results equal or exceed specified compressive strength and no individual strength test result falls below specified compressive strength by more than 500 psi.

C. Test results will be reported in writing to Owner and Project Engineer, ready-mix producer, and Contractor within 24 hours after tests. Reports of compressive strength tests shall contain the Project identification name and number, date of concrete placement, name of concrete testing service, concrete type and class, location of concrete batch in structure, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength, and type of break for both 7-day tests and 28-day tests.

D. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted but shall not be used as the sole basis for acceptance or rejection.

E. Additional Tests: The testing agency will make additional tests of in-place concrete when test results indicate specified concrete strengths and other characteristics have not been attained in the structure, as directed by Project Engineer. Testing agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods as directed.

PART 4 – MEASUREMENT AND PAYMENT, NOT USED

END SECTION 03300

SECTION 13200
STEEL BOLTED WATER STORAGE TANK

PART 1 - GENERAL

1.01 SUMMARY

A. This section includes the installation of a bolted steel tank consisting of a glass-fused-to-steel tank.

1.02 RELATED WORK

A. Section 02315 – Trench Excavation and Backfill

B. Section 13205 - Disinfection of Tank

C. Section 03300 - Concrete

1.03 REFERENCES

A. AWWA 103-97

B. AWWA M42

C. ANSI/AWWA C104/A21/4 – Cement-Mortar Lining for Ductile Iron Pipe and Fittings for Water

D. ANSI/AWWA C110/A21.12 – Ductile Iron and Gray Iron Fittings, 3-inch through 48-inch, for Water and Other Liquids

E. ANSI/AWWA C153/A21.53 – Ductile Iron Compact Fittings, 3-inch through 16-inch, for Water and Other Liquids

F. ANSI/AWWA C111/A21.11 Rubber-Gasket Joints for Ductile Iron and Gray Pressure Pipe and Fittings.

1.04 SUBMITTALS

A. After award the Contractor is required to furnish to the Owner, for approval and at no increase in contract price, six sets of complete documentation and construction drawings. When approved, two sets of such prints will be returned to the Contractor and these drawings shall then govern the work detailed thereon. A Registered Professional Engineer licensed in the state of the tank supplier's residence shall stamp any tank design calculation submissions. The approval by the Owner of the Contractor's drawing shall be an approval relating only to their general conformity with the contract drawings and specifications and shall not guarantee detail dimensions and quantities. There shall be no deviation from these drawings and specifications except, upon written order or approval from the Owner.

B. One copy each <u>with bid</u>:

1. General plans showing height, diameter, shell, roof thickness, accessories and piping

connections.

2. Certificate signed by a Registered Professional Engineer attesting to the adequacy of the tank design and a statement that a copy of structural design calculations for the tank will be submitted for review after award.

C. Six copies each after award:

1. Detailed material and structural plans for the tank, connections, and accessories.

2. The manufacturer's name, brochures, models, dimensions and any other pertinent information necessary to describe the following:

a. Safety cage with locking gate, safety climb, and step-off platform
b. Roof access hatch and vent
c. Shell manway
d. Overflow pipe
e. Catch basin with grate
f. Link Seal applications
g. Ductile iron inlet/outlet and flushline piping and fittings
h. Grout mix design
i. Cane Fiber joint filler
j. Polyethylene sheeting and soil sterilent
k. Disinfection methods and processes

D. One copy after award: The engineering calculations for the design of the tank signed by a Registered Professional Engineer.

1.06 DELIVERY, STORAGE AND HANDLING

A. All tank parts shall be protected from damage prior to packing for shipment, during shipment, and during erection. All parts with damaged or incomplete finishing for the tank shell and roof will be rejected and must be replaced.

1.07 ACCEPTANCE

A. Work covered by this section will not be accepted until the backfilling and testing related with the work has been completed satisfactorily.

1.08 WARRANTY

A. Warranty - The tank Contractor shall guarantee the tank against any defects in workmanship and materials for a period of 1 year from the date of acceptance. If any such defect shall appear and is reported in writing to the Contractor during the warranty period, the Contractor shall make any necessary repairs without charge to the Owner.

B. Anniversary Inspection - The Contractor shall provide a one-year anniversary inspection complete with a written report.

PART 2 – MATERIALS

2.01 STEEL BOLTED TANK

A. Glass-fused-to-steel Bolted Tank equal to that manufactured by Aquastore or Fusion Tanks and Silos.

B. 200,000 Gallon Capacity

C. Nominal Diameter 42 Feet

D. Nominal Liquid Height 19 Feet

E. Plates and Sheets: Plates and sheets used in the construction of the tank shell shall comply with the minimum standards of AWWA D103, Section 2.4.

F. Rolled Structural Shapes: Rolled structural shapes shall conform to the minimum standards of AWWA D103, Section 2.5

2.02 ALUMINUM DOME TANK ROOF

A. The roof shall be a TEMCOR clear span aluminum dome structure providing for all features stated in TEMCOR's standard "ALUMINUM DOME SPECIFICATION", or approved equal, with all appurtenances as shown on the contract drawings and specified herein. The dome structure shall be a fully triangulated, all aluminum space truss complete with non-corrugated closure panels.

B. The roof shall be clear span and self-supporting from the periphery structure.

C. Both live and dead loads shall be carried by the roof structure on the tank walls. The tank walls shall carry the entire roof load. Full provisions shall be made to allow for thermal expansion. The dead weight of the dome shall not exceed 3.5 pounds per square foot of surface area.

D. The manufacturer shall furnish a roof opening which shall be placed near the outside tank ladder and which shall be provided with a hinged cover and a hasp for locking. The opening shall have a clear dimension of at least 24 inches in one direction and 15 inches in the other direction. The opening shall have a curb at least 4 inches in height, and the cover shall have a downward overlap of at least 2 inches, or a gasketed weather-tight cover in lieu of the 4-inch curb and 2-inch overlap.

E. The dome surface shall be designed as a weather-tight system under all design load and temperature conditions. All raw edges of the aluminum panels shall be covered, sealed, and

firmly clamped with batten bars in an interlocking manner to prevent slipping or disengagement under load and temperature changes.

F. The roof framing system shall be designed as a three dimensional truss with moment-resisting joints. The design must consider the increased minor axis bending and compression induced in the framing members due to tension in the roof panels. The structural analysis shall be performed using stiffness analysis models. The structural computer models shall include the effect of geometry irregularities such as dormer openings and perimeter support members. The design of the welded components shall be done in accordance with the Aluminum Structural Welding Code ANSI/AWS Dl.2-90. Dissimilar materials that are not compatible shall be physically separated or insulated from each other by means of gaskets or insulating compounds.

2.03 BOLTS

A. Bolts, nuts, and washers: Minimum 1/2-inch diameter and shall meet the minimum requirements of AWWA D103, Section 2.2.

B. Other bolts shall conform to or at least be equal in strength to the latest revision of ASTM A-307.

2.04 SEALANTS

A. Sealants: Flexible, conforming to FS TT-S-00230 Type II non-sag, I-self leveling, Class A; Vulkem 116 manufactured by Mameco International, Sikaflex-lA; or equal.

B. Bold Head Encapsulation: High impact co-polymer encapsulation of entire bolt head. Optional 316 stainless steel nuts, bolts, and washers.

2.05 LOADS

A.	Specific gravity	1.0
B.	Wind Force	140 mph
C.	Roof Snow Load	180 psf
D.	Earthquake Seismic Zone	Seismic Zone 2B

2.06 STEEL TANK SURFACE FINISH

A. Color – The color of the exterior surface shall be forest green.

B. Interior and exterior tank shell composition shall be of Type 304 Stainless Steel, ASTM-A-240, SME-sa-24O, cold worked to build high yield strength or glass fused to steel.

C. Structural shapes and web trusses on exterior of tank only shall be ASTM-A-36 structural steel with hot dipped galvanized coating, to ASTM A123 and ASTM A153.

D. All tank parts shall be inspected and approved prior to shipment. Factory inspection shall include a holiday detection test (Tinker Rasor or equivalent), if appropriate. An Owner's representative may be present during testing.

E. Sheets with two or more holidays may be repaired as approved by the Engineer. The Engineer also has the option of rejecting sheets with multiple holidays.

F. All small parts and appurtenances shall be hot dip galvanized in accordance with ASTM A386.

2.07 TANK ACCESSORIES

A. Shell Manhole: Two circular shell manholes with minimum opening of 24 inches in diameter, of a gasketed flat plate hatch bolted to manway flange type. The manhole, hinge and reinforcing shall be in accordance with AWWA D103, Section 5.1.

B. Inlet/Outlet Connections: The tank inlet/outlet connections shall be of the size noted on the plans, restrained mechanical joint, AWWA approved, Class 52 ductile iron pipe for potable water applications.

C. The inlet/outlet pipe shall terminate a minimum of 24 inches above the inside bottom of the tank. The piping shall extend into the meter vault as shown on the plans.

D. The drain pipe shall be constructed in a sump as shown on the plans with the sump being built to the dimensions shown.

E. The buried ductile iron pipe, restrained mechanical joint elbows, and valve exterior surfaces, exposed to soil or backfill, shall be bituminous coated (Koppers 300M or equal) and wrapped with two layers of 6 mils polyethylene sheeting or 8 mils polyethylene encasement to protect against corrosion.

F. Concrete thrust blocking is required on the buried elbows, tees, and gate valves. The piping assembly shall be pressure tested at 150 PSI for 1 hour before backfilling and shall be free of leaks. Refer to Section 02510 for additional pressure testing details.

G. Overflow: The tank shall be equipped with stainless steel overflow piping installed on the outside of the tank, as shown on the plans. The overflow piping shall be supported by galvanized steel brackets and connectors, or approved equal, anchored securely to the tank wall. The above ground portion shall be constructed of 10-inch Type 304 steel pipe. The pipe flow must be directed at the center line of the catch basin so as to improve the flow characteristics of the system and minimize splash effects. The overflow pipe shall terminate 12 to 24 inches above the catch basin and shall have a 24 mesh wire screen covering the end

of the pipe. The screen shall be attached in a manner such that is difficult to vandalize and remove.

H. Catch Basin: The catch basin shall be constructed with the materials and to the dimensions as shown in the drawings. If a flanged bell end of the pipe is not used for the transition between concrete and the pipe a different type of water stop must be installed as approved by the Project Officer. The steel grating shall be fastened to the concrete as shown. The number of fasteners called for are required in order to make it more difficult to vandalize and remove. The bentonite soil seal shall run under the catch basin's concrete construction.

I. Access Hatch: A suitable roof access hatch shall be furnished in the roof structure beside the ladder step-off platform in accordance with the manufacturer's recommendations and as described in Article 2.02.

J. Vent: A suitable vent shall be furnished above the maximum water level of the tank. The vent shall have sufficient capacity to pass air such that at the maximum possible rate of the water either entering or leaving the tank, pressure will not be developed which will exceed the roof design loads. The overflow pipe shall not be considered to be a tank vent. The vent shall be so designed and constructed as to prevent freezing. It shall be screened to prevent the entrance of birds, rodents and insects.

K. Outside Tank Ladder and Accessories: The exterior ladder system shall be provided by the tank manufacturer. The ladder system shall begin 8 feet above the tank bottom at the location designated. It shall also include a roof ladder, railing, and step-off platform at the top, in order to provide easy access to the tank access hatch.

L. A notched safety rail with climbing device and safety belt shall be provided and installed on the ladder. The bottom section of the ladder shall be furnished with a minimum 2-foot wide by 6-foot high aluminum security gate with hinges, hasp, and provisions for a padlock equal to Ladder Gate, as manufactured by Antenna Products Division, Mineral Spring, Texas.

M. Outlet to Waste Piping: The catch basin and tank drain piping shall be connected and surface as indicated on the plans. The drain piping shall be PVC with a minimum standard dimension ratio of 32.5 (125 psi) and conforming to ASTM 2241. A flap gate shall be attached to the end of the pipe. The flap gate shall be a hinged gate with a neoprene seal to provide a positive seal.

2.08 STEEL FLOOR

A. The proposed tank shall have a steel floor in accordance with the provisions of AWWA D103-97, Sec 11.4.1.2, Type 2, with a ½ inch thick cane-fiber joint filler meeting the requirements of ASTM D1751. Starter ring leveling is required and the maximum differential elevation within the ring shall not exceed one-eighth (1/8") inch, nor exceed one sixteenth (1/16") inch within any ten (10) feet of length.

2.09 GRAVEL COVER

A. Bentonite - Envirogel 10 by Wyo-Ben, Inc or equal

B. Sheeting – 6 mil thick plastic sheeting

C. Sterilant - equal to Primatol

D. Gravel – Washed ¾ inch minus

PART 3 – EXECUTION

3.01 GENERAL

3.02 DELIVERY, STORAGE, AND HANDLING

A. All plates, members and miscellaneous parts shall be packaged for shipment in such a fashion to prevent abrasion or scratching of the tank finish. Damaged parts or parts with damaged coatings will be rejected.

3.03 WATER TANK ERECTION

A. In accordance with Section 8, AWWA D103-97.

B. Install equipment specified herein in accordance with manufacturer's written instructions and approved submittals.

C. Maximum variation from plum: ¼ inch in any 10 feet of vertical rise or ½ inch for total height of tank.

D. Exercise particular care in handling and bolting tank plates and members to avoid abrasion and scratching of materials.

E. Seal joints between plates with sealant in accordance with the sealant manufacturer's recommendations for surface preparation, temperature, pressure, environmental conditions, and miscellaneous requirements.

F. Bolting: install encapsulated bolt head to inside of tank, torque to manufacturer's recommendation, maximum ½ inch of thread projection beyond nut.

3.04 TESTING TANK

A. In accordance with Section 9, AWWA D103-97.

B. Following completion of erection and cleaning of the tank, the structure shall be tested by the Contractor for liquid tightness by filling the tank to its overflow elevation.

C. Any leaks disclosed by this test shall be corrected by the Contractor in accordance with the manufacturer's recommendations and as approved by the Project Officer.

D. The utility owners may furnish water required for testing, however, prior arrangements must be made with the utility.

3.05 DISINFECTION

A. Tank shall be disinfected in accordance with Section 13205.

3.08 GRAVEL COVER

A. The area within 10-feet around the tank perimeter shall be graded, sealed with bentonite, sterilized, and covered with plastic sheeting and gravel.

B. The area shall be excavated to a depth of 3 inches below final grade, shaped, smoothed and any surface irregularities corrected by blading.

C. The area to be covered with gravel will be sealed with bentonite at the rate of 3 pounds per square foot and vigorously tilled in. The tilling operation shall be done in accordance with the manufacturers recommendations.

D. The area shall be sprayed with a soil sterilant in accordance with manufacturer's recommendations.

E. The treated ground surface shall be completely covered with plastic sheeting. The sheeting joints shall overlap a minimum of 6 inches. The sheeting shall be sealed with adhesive to the foundation wall.

F. The area within 10-feet around the tank perimeter shall be covered with a uniform 4-inch layer of washed gravel.

3.06 SITE GRADING AND CLEANUP

A. Site Grading and Cleanup: Upon completion of tank, the Contractor shall clean the site of all rubbish and grade the earth to provide effective drainage away from the base of the tank. The slope shall be 5% extending from the base in all directions a distance of 10-feet away from the tank.

PART 4 – MEASUREMENT AND PAYMENT, NOT USED

END SECTION 13200

SECTION 13205
DISINFECTION OF POTABLE WATER TANKS

PART 1 – GENERAL

1.01 SUMMARY

A. This section describes the requirements for disinfecting a municipal water reservoir or municipal water standpipe.

4.03 REFERENCES

A. AWWA C652-92 – Disinfection of Water Storage Facilities

PART 2 – PRODUCTS, NOT USED

PART 3 - EXECUTION

3.01 PREPARATION AND TEMPORARY PROVISIONS

A. Injection Points: Provide a temporary saddle and corporation stop for the purposes of injecting chlorinated solution (if chlorination method 1 is chosen).

B. Sample Tap: Install a corporation stop saddle and sampling bib in the check valve vault for bacteriological sampling. Consult with the Project Engineer or his representative regarding the placement of the saddle.

3.02 DISINFECTION

A. Chlorination Method: Choose one of the following methods of AWWA C652-92 for disinfecting the water reservoir.

1. Chlorination Method 1:

a. Fill the tank to the overflow level with potable water with chlorine added to bring the free chlorine residual to a level that will result in 10 mg/l.

b. If the water was chlorinated continuously during filling, the retention period shall be 6-hours. If the water was chlorinated by adding sodium or calcium hypochlorite within the tank, the retention period shall be 24-hours.

c. After the chlorination period, the free chlorine residual shall be decreased below 2 mg/l via dilution with potable water and tested for bacteriological safety.

2. Chlorination Method 2:

a. Apply a solution of 200-mg/L available chlorine directly to the interior surfaces of the reservoir, including the inlet and outlet piping interior.

b. Application Methods: Apply with suitable brushes or spray equipment.

c. Retention: Ensure that the surfaces remain continuously wetted with the required solution for at least 30 minutes.

d. Bacteriological Testing: Fill the tank with potable water to bring the free chlorine residual below 2 mg/l, and then sample for bacteriological safety.

B. Bacteriological Testing Results:

1. If, after disinfection activities are complete, a positive bacteriological result is obtained, consult with the Project Engineer as to whether rechlorination is necessary.

2. Provide two negative bacteriological results to demonstrate that a positive bacteriological problem has been remedied.

3.03 DISPOSAL OF CHLORINATED WATER

A. Waste flushed disinfection water in an environmentally safe manner. In no case shall direct disposal to surface water bodies be permitted.

1. Check the chlorine residual at time of disposal.

2. If disposal to a community sewer system is available, neutralize the chlorine residual if the free residual is above 10 mg/l.

3. If disposal is to the ground surface or ditch, neutralize the chlorine residual if the free residual is above 1 mg/L.

4. Use the following neutralization chemical schedule:

a. Sulfur Dioxide at 0.8 lb / 100,000 gallons / mg/L of free chlorine.

b. Sodium Bisulfite at 1.2 lb / 100,000 gallons / mg/L of free chlorine.

c. Sodium Sulfite at 1.4 lb / 100,000 gallons / mg/L of free chlorine.

d. Sodium Thiosulfate at 1.2 lb / 100,000 gallons / mg/L of free chlorine.

PART 4 – MEASUREMENT AND PAYMENT, NOT USED

END SECTION 13205